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New Technologies And Intellectual Property Rights:

THE INTERNATIONAL DIMENSION

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by

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Executive Summary

This report considers international copyright as an instrument of adjustment of rights and interests domestically and among nations.

There are other modes of intellectual property protection, chiefly patents and trade secrets, but the first is very difficult to obtain and the second is very difficult to keep.

International copyright is grounded predominantly in domestic law. The Berne Convention of 1886 levies a few minimal substantive requirements on its signatories, but the Universal Copyright Convention of 1952--to which the United States belongs --imposes none. The UCC obliges its members, essentially, to provide "adequate and effective" copyright protection and to extend national treatment to foreign works.

There are advantages to this approach. The "adequate and effective" standard, while unspecific, operates somewhat like the due process clause in the U.S. Constitution to keep developing practices consistent with civilized usage. The reliance on national treatment assures that policy positions are settled domestically before being tried out internationally.

Despite broad acceptance of the two basic treaties, unauthorized use of copyrighted works is widespread. The reasons are many and varied: Some countries have signed no convention, others have domestic laws that are inadequate or out of date, still others have no effective enforcement machinery. Then there are non-infringing uses, typified by fair use or works in the public domain or reasonable policy disagreements. (Cable transmission of broadcast signals was until 1978 not a copyright infringement in the United States, and still is not in Canada; unlicensed reception of satellite signals could be a violation of the 1974 Brussels Treaty but would be legitimized by 1984 legislation submitted to the U.S. House and Senate.)

Outright resistance to international copyright obligations, where it occurs seems to take place without regard to the customary socio-political boundaries or distinctions. The Soviet Union, for its first 50 years a conspicuous "outlaw" on the intellectual property front, has since its accession to the UCC in 1973 behaved like a model copyright citizen. The BBC, on the other hand, is resisting the intrusion of broadcast signals carried over U.S.-origin technologies; while OECD--a bastion of the First World--is girding itself to proclaim that international information flows must respect the rights and interests of indiviaual nations.

That is the language of information mercantilism, or "Information Sovereignty" if you will. As a phenomenon, this

is not something peculiar to the Third World, although it may get some of its dynamism and much of its rhetoric from that quarter. Rather, the impulse to appropriate what is foreign and protect what is national seems stimulated mainly (a) by a country's net information-trade position, as an exporter or importer, and (b) by intrusive or opportune information technologies.

In today's environment of massively interpenetrating information flows, a country can feel driven by cultural and social and political--as well as economic--concerns to assert and preserve its own information resources, its own identity: its Information Sovereignty. That was long true of the United States, which for its first century was an international copyright "outlaw" and for the next half century a determined outsider. (Charles Dickens complained vigorously against the 19th Century American piracy of his works.) Today, of course, the U.S. is the world's largest exporter of copyrighted works, which gives it a strong interest in reliable international protection. The question is how best to promote that.

Three methods have recently been pursued: (1) the updating and extension of multilateral treaties, like the UCC; (2) the negotiation of intellectual property clauses in bilateral trade and investment agreements; and (3) a process of coercive unilateralism, whereby an American trade or other benefit is conditioned upon the instructed strengthening of a foreign country's domestic copyright regime. (The Caribbean Basin Initiative and the General System of Preferences are two instances of the latter.) Both unilateralism and, to some extent, bilateralism appear open to substantial criticism--as counterproductive, inconsistent with the multilateralism of GATT and the UCC, and inadequately attentive to the broader interests the U.S. has in relations with such recently belabored governments as Singapore and Jamaica. The exercise of "muscle diplomacy" on the highly valuable but delicate fabric of information relations can look like the abdication of world leadership rather than its exercise.

The American information industries that have been pressing for these results are made up of companies that are understandably concerned to maintain or restore copyright protection for the works they distribute. The question for them, and for American interests generally, is the balance between activism and reflection, between short-term and longer-term achievements. A broader mix of industry participants in the U.S. policy process, particularly from the computer and software sectors, could help establish an effective balance.

As it happens, the frontier of international copyright controversy has recently moved to computer software. The leaders of the two main treaty organizations, and the U.S. Register of Copyrights, have expressed the view that computer programs are utilitarian and not a proper subject for copyright. The Congress and the courts in this country have disagreed, as have most West European authorities. The Japanese, however, have proposed a sui generis law that would limit software protection to 15 years and exact a compulsory licence for domestic firms. The proposal has been retired for the moment, but the idea will be pursued in international forums by the Japanese trade ministry. Here is where the measured, thoughtful pace of UCC and Berne deliberations--which typically proceed at both expert and political levels--should help to cushion and eventually accommodate the sharply conflicting views on this commercially significant question.

The two treaty organizations have performed that sort of role in relation to the Third World, many of whose countries succeeded to Berne or UCC obligations by virtue of their colonial powers. These countries' own push for fresh consideration of LDC needs foundered at first at a special Stockholm conference in 1967, but was dealt with thereafter in 1971 protocols to the two treaties. Some continuing assistance with training of copyright administrators is still being offered, but this needs to be widened and deepened; and it would be very much in the interests of the United States, which has no Third World copyright training program of its own, to set one up and fund it.

Keeping pace with innovation is more than just a matter of training; it is a legal and legislative problem everywhere. Sui generis laws and proposals are a testament to that, as are blanket and compulsory licenses and the emergence of proposals to levy a fee on reproduction equipment. The global truth is that the new information technologies have greatly expanded the extent to which copyright uses today may go undetected and uncompensated. The problem has engrossed experts meeting under the UCC and Berne umbrellas, and has equally occupied the time and talent of specialists within the United States. Since international copyright enforceability must start with the regime of domestic law, it is necessary to look first at the evolving American view of these matters.

Is copyright viable in the new circumstances? Can there be "property", in any real sense, in something so fugitive as information? Should the whole concept be abandoned, as Harlan Cleveland and Ithiel de Sola Pool among others have suggested? This report proposes as an analytical matter that a rigorous distinction be observed between intellectual "works" on the one hand, and "uses" on the other. The first category presents no special technological difficulty. There is a need to distinguish utilitarian from non-utilitarian works, and to consider patent or sui generis protection as an alternative to copyright, but that would be true with any technology--and both the 1976 Copyright Act in this country, and Berne and UCC abroad, leave room for that kind of judgment to be made.

The real trouble arises with "uses". In the Betamax case, there was never any question of the copyrightability of the broadcast "works" that were being copied. The issue was, did private reproduction by video cassette recorders constitute an infringing "use"? VCR technology--like a number of others--facilitates uses that are decentralized and undetectable. In this particular case there was no infringement, because time-shifting in the Supreme Court's view is a fair use. But the technological question remains and has in effect been "sent back" to Congress. Is it manageable?

This report sets forth a suggested institutional matrix that could help to make the technological issue manageable. Congress under this proposal should maintain its existing copyright committees, joining them with the foreign affairs committees on occasion for supervision and direction of international copyright developments. It should affirm the generic scope of section 102 of the Copyright Act, clearing up in the process the ambiguity in the 1976 committee reports on this question. Congress should also declare a presumption against future legislative extension of the Copyright Act to new works not covered by this generic scope, while leaving itself open to consider sui generis protection on an ad hoc basis. And Congress should stimulate the Library of Congress' Congressional Reference Service to establish an advisory competence in the copyright field, against the day when the Copyright Office moves from the legislative to the Executive branch.

In the Executive, the inter-agency Working Group chaired by the Commissioner of Patents is well thought of and should be continued. Movement of the Copyright Office into the Patent Office, which might then be called the Intellectual Property Office, would round out the competence of this group. The principal justification for such a move would be that, in an Information Age, the management of information policy should be held politically accountable.

For international copyright, chief policy responsibility within the Executive should be assumed by a revitalized Department of State. This should be done by latching on to other reform proposals, which in brief would see to the creation of an Assistant Secretary of State for International Communications and Information Policy, with interagency lead authority, backed up by (among others) a Director for Intellectual Property.

From the private sector, there should be a small high-quality advisory group--with an emphasis on balance and on practical experience--to meet regularly with public-sector officials in full public view. Its role should be to monitor new uses and available remedies, keeping abreast of technological and economic developments, court decisions, and international transactions. It should be endowed with its own separate staff and resources, and should make periodic reports and recommendations to Congress and the President. This seems little enough to ask for a field of enormous comparative advantage to the United States.

Finally, all of these instrumentalities of policy should assist the Congress to keep abreast of innovations as follows. If and when established remedies are found inadequate to deal with new uses, the policy makers would examine the options: (a) to leave the parties where they lie, or (b) to create a new remedy such as blanket or compulsory licensing, or a levy on reproduction equipment. In addressing choice (a), they would consider the practical availability of self-help remedies and of private remedies (for, *e.g.* unfair competition) under other state and federal laws. In approaching choice (b), they would entertain a presumption in favor of the least possible government intrusion, *i.e.*, against government tribunals or rate-setting.

This scheme, whose operations should be scheduled for comprehensive review at the end of ten years, might not settle all theoretical debates but it should provide a framework for solid, workable policy. It is also consistent with the generic provisions, Articles I and II, of the UCC and Berne treaties, so that they could continue in force without change.

Taking this approach, and adopting the modest institutional reforms suggested here, would equip the United States to take on the leadership in international copyright matters that its own interests require.

NEW TECHNOLOGIES AND
INTELLECTUAL PROPERTY RIGHTS:
The International Dimension

by

Roland S. Homet, Jr.

> "If, as the familiar aphorism has it, copyright is the metaphysics of the law, then international copyright must be its cosmology."[1]

The subject is indeed vast and at times almost Valhallan in the dimensions it can plumb and the disputations it inspires. But it has its practical side as well, and an ambition that is not too grand may perhaps bring some order to its consideration. That is the aim of this report.*

The plan of the report is to consider first the tools and concepts of intellectual property, distinguishing copyright from patent and other related protections so we can see what it is that figures in international transactions. Here as later, much of the detailed definitional work may be done by others but it is necessary to have a working idea of what is at issue.

The report will next consider the international environment, examining the reach and limitations of the various pertinent treaties and the kinds of depredations--both commercial and governmental--with which they must contend. What is "piracy", we will ask, and what is an "adequate and effective" counter to it in national laws? At this point the concept of "information sovereignty" will be introduced from the related province of trans-border data flows, and examined for its pertinence to intellectual property. The history of U.S. respect for copyright will be traced, along with present U.S. options to protect its world-leading exports either multilaterally, bilaterally or unilaterally.

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* We have been helped along the way by numerous interviews and by guidance to the literature, all acknowledged in the footnotes. A general expression of gratitude is offered here, punctuated by special thanks to Lewis I. Flacks, senior advisor in the Copyright Office, for the time he devoted to the reduction of a non-specialist's ignorance. The Copyright Office also conducted a timely and informative three-week symposium on "The Sources of International Copyright Law" in June of 1984, which served to launch this study.

Part III of the report will introduce and describe the activities and interests of major "stakeholders": international agencies, selected governments, and representative American enterprises. It will also give specific consideration to safeguarding the interests of the general public.

The report will then turn to an identification of major current trends--economic, social, and technological--that impinge on the nature or effectiveness of intellectual-property protections. Others may again provide much of the detail. We will consider the forces that may be transforming copyright and even drawing into question its continued viability.

In the closing section we will address the resulting policy issues and options. Is intellectual "property" now an outmoded concept? Are self-help remedies an adequate alternative? How if at all can the law keep pace with technological innovation, and how should the various agencies of government be structured for that purpose? Is there need for international treaty modification? What other legal and political arrangements should be made to situate American interests more successfully in the evolving framework of domestic and international "information societies"? We will draw the choices to a head with a specific governmental model and some concluding observations on building a regime of sustainable reciprocal self-interest for the 21st Century.

* * * * *

I. SCOPE AND DEFINITIONS

A. Legal Regimes for Intellectual Property

Article I, Section 8, clause 8 of the United States Constitution empowers Congress

> "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."

The emphasis is on a limited grant of private powers for public purposes. In its recent Betamax decision, for example, the Supreme Court majority stated that : "The monopoly privileges that Congress may authorize are neither unlimited nor primarily designed to provide a special private benefit." This is the accepted view of the Patent and Copyright Clause--that it aims to balance rewards for creators against those for users, incentives to produce against opportunities for access.[2]

It is possible, however, that Congress may be able to escape the Constitutional necessity for such balance by exercising its control over intellectual property under the more general grant of power in the Commerce Clause (Section 8, clause 3). This authorizes the national legislature "To regulate Commerce with foreign Nations, and among the several States...." When adopted, and for the next 150 years, the Commerce Clause was a constraint on Congressional authority because it did not apply to commerce generally, which was reserved to the States. Since the New Deal, however, there has been no effective legal limitation on Congress' authority over intrastate commerce, which is now plenary in substance if not in form. There is not, accordingly, the need that there once was to resort to the Patent and Copyright Clause for avoidance of jurisdictional limitations. If this argument is accepted, it suggests that--purely as a matter of power, and not of policy or discretion--Congress could legislate protection for intellectual creations that was neither limited in term nor public in benefit.[3]

NB: CONSTITUTIONAL BARGAIN !?

That has not been the pattern of legislation to date, however, and there is no present reason to suppose that it will become so. The considerations that impelled the Framers to require a balanced treatment of patents and copyrights may have changed their identities somewhat but not their saliency. As America and the rest of the industrialized world settle into the Information Age, and information is increasingly recognized as an economic resource equivalent in value to energy or finance, two things happen: (1) Incentives to information creation and commercialization acquire new importance; and (2) so do the free-flow postulates of public access to and use of such information. The tension between these competing values tends to assure a legislative balance even if the Copyright Clause no longer does.[4]

In fact the present federal law of patents and copyrights is limited in its grant of monopoly rights and balanced in its objectives. But it is by no means the only source of protection available to intellectual property owners. There is also the state law of contracts, trade secrets, and unfair competition, as well as the federal and state laws of trademark. Proprietors and their counsel habitually consider all such protections together, and we should begin by doing the same.[5]

Patents offer very strong protection. They empower the holder to exclude others from making, using or selling whatever is covered by the patent. The holder can thus block a wholly independent inventor from exploiting the same discovery. On the other hand, a patent is extremely difficult and very expensive to obtain. To secure it, a discovery must pass examination as something that is both novel and non-obvious to somebody versed in the art. That is hard to prove.[6]

Copyright by contrast is much easier to obtain and not nearly so valuable when in hand. A "writing", to use the Constitutional expression, need not be novel; it need only be "original", which means a non-copy. But copyright does not protect against the appropriation of an idea, which may be what has the real value. It safeguards only the expression of that idea, and even that may be duplicated by independent effort. So, a determination that a new work is copyrightable--which is the typical focus of inquiry in relation to new technology--may not carry such great importance in the marketplace.[7]

Another alternative is trade secret protection based on contract or fiduciary relationships. Like a patent, a trade secret protects the idea and not just the expression. Its informational content is safeguarded not by public law but by private measures against disclosure. It is difficult, however, to prevent disclosure if the work in question must enter a mass market. Proprietary computer programs, for example, can maintain trade seccrecy in a service-bureau operation but not so well if licensed to others to run on their own computer systems. A whole, costly network of contracts and of vigilant procedures is necessary to the enterprise.[8]

Trademarks and the law of unfair competition round out the picture. Both are addressed primarily to misappropriation of the identity of a product or service, or of the reputation earned by its provider. Neither is specifically applicable to the questions created by new technologies. For them, the choice usually comes down to copyrights or patents or trade secrets, and the key features of these respective laws have been summarized as follows:[9]

	Copyright	Patent	Trade Secret
Term	Life + 50 or 75	17 Years	Perpetual but Terminable
Cost of Maintaining	Nil	Nil	Heavy
Loss of Protection	Gross Neglect	Unsuccessful litigation	Disclosure

This report will focus on copyright, because patent protection for new information technologies is usually not available at acceptable cost and because trade secrets--when employed --operate to keep intellectual property out of the discernible stream of commerce. We will examine the suitability of copyright concepts to open commercial use of today's technology.

B. Copyrightability

Copyright, to begin with, attaches to a "work", definable broadly as an intellectual creation embodying originality though not (necessarily) novelty. Under this general dispensation, copyright has evolved over the years to attach itself to: books, and print materials generally; plays, films, videotapes, and live broadcasts, first as performances of an underlying literary work and later in their own right or through "neighboring rights"; sound recordings, including tapes and cassettes; and several odd bits and pieces, such as choreographic notations and architects' plans. Today the frontier of copyrightability has moved to such things as computer programs and other software, data bases, and semiconductor "chip" technology.[10]

Despite the generality of the concept of "works", the evolution of copyright coverage has been stutteringly slow and uncertain. Sound recordings, for example, which Congress determined in 1971 to be "clearly within the scope" of Constitutional protection, had never until then been covered by statutory copyright. In the Betamax case, the Supreme Court made much of the fact that, as reflected in the history of copyright legislation, technology changes have repeatedly been treated as occasions requiring statutory change. So one question is whether the federal Copyright Act, laboriously revised and modernized in 1976, is written or administered or enforced in such a way as to be able to keep pace with technological innovation. It is a question to which we will return.[11]

A related question is whether the copyrightability of foreign works under U.S. law is to be construed in accordance with comity or governed by considerations of protectionism. The U.S. for decades refused to join the Berne Convention, ostensibly to preserve "formalities" that, from the beginning included a requirement of manufacture in this country--clearly a protectionist measure. After 1955, when the U.S. joined the Universal Copyright Convention, this manufacturing clause was made applicable only to U.S. authors; but it is still a piece of trade discrimination, and has been ruled invalid for this reason by the GATT. The question for the future is whether the U.S. is ready to seek common cause with the international copyright community, as a follower or a leader.[12]

C. Rights and Remedies

As the name suggests, "copyright" confers the power to control--to grant, deny, or license on condition--the "copying" of a work. This is considered so obvious that no one troubled to make it explicit in international law until 1971. But the power also extends beyond its origins to encompass, today, the control over reproduction, adaptation (including translation), distribution, performance, and display. It is a compendious set of rights.[13]

The rights are backed up, at least in Anglo-American jurisprudence, by extensive remedies. In civil actions for infringement, these may include damages either actual or statutory, injunction, accounting for profits, the impoundment during litigation and later destruction of offending works including their matrices, masters, plates, or negatives; plus, in cases of willfulness, the award of punitive damages. Criminal penalties comprising fines, penalties, and imprisonment may be assessed. In addition, there are import-restriction measures of varying effectiveness that may be used to bar entry of known infringing works.[14]

All of these are measures to enforce economic or property rights, which has traditionally been the focus of Anglo-American copyright law. Side by side with that concept, however, there has also existed in Continental law the notion of author's rights or "moral rights". The idea they embody is that the creator of a work has a protectible interest in the "personality" as well as the property of a work. Thus, the author should be able to establish his or her authorship and to safeguard the work against editorial distortion, withdrawing the work from circulation if necessary to enforce those rights.[15]

Copyright can be used in this country for such purposes, with carefully crafted and controlled license provisions. The widow of Malcolm Lowry did just that with the film rights to "Under the Volcano", insisting on rigorous artistic fidelity to her husband's novel and running through many would-be producers and actors and directors before settling on a satisfactory script and production team. But that is far from the usual case. Ordinarily, a creator assigns or licenses all his interests in return for an economic reward. He or she may be put under contract to a film or stage production, but commercial and artistic control typically shifts to an entrepreneur; and if the conception of the author is butchered, there is no copyright recourse.

That could not happen with "moral rights", whose essence is that they are inalienable. Moral rights do not pass with the copyright license but remain in the author or his family. Thus the creator can always protect both the integrity of his work and its paternity.[16]

The 1928 Rome text of the Berne Convention introduced the notion of "moral rights" into copyright treaty law, and thus drove a conceptual wedge between Continental and Anglo-American systems. Actually, most of the rights made enforceable by this concept could be vindicated in common-law courts as well, using different legal principles: breach of contract, defamation, invasion of privacy, unfair competition, interference with the right of publicity, even trademark infringement. In 1977, for example, the creators of "Monty Python" sued successfully in an American court to enjoin excessive editing of a taped television show. But the rubric of "droit moral" as such has been judged unsuitable after careful assessment by both English and American authorities, on conceptual and practical grounds: It would not fit into the structure of existing law, and it would unbalance the copyright bargain too far in favor of the creator.[17]

D. Interested Parties

Control over the economic value of a copyright is, as we have seen, usually alienated by an author or creator to others by way of license or assignment. This and succeeding sublicenses create a chain or rights and interests in what are typically the following classes:

Information creator--individual, family, organization
Information packager--publisher, producer, syndicator
Information distributor--through any or all media
Information user--public or private consumers

It remains to consider the relationship among these classes.

The first observation is that domestic creators have an interest in championing copyright coverage for foreign works. This drives up the cost of competing product and establishes a margin for payment of the domestic creator. The packagers and distributors and users of course have an opposing interest, except insofar as international copyright may be thought to promote a generally beneficial flow of commerce and culture.[18]

The creator is largely dependent on the attitudes and exertions of these other parties to realize his reward. Their gross receipts, often minus expenses beyond the creator's knowledge or control, form the basis for calculating his percentage return. The Register of Copyright has suggested that present enforcement systems are too much concerned with unauthorized use and not enough about the division of rewards between creators and exploiters: "Increased attention," he has written, "must be given to how payments for the use of protected works are distributed as well as how they are collected."[19]

There are also different interests operating as between the user and the distributor or packager, concerning the costs and conditions for enjoyment of a work. The user's interest is supposed to be protected by public policies assuring an open and competitive information marketplace. While there are ample reasons to doubt the present efficacy of such policies, their failings are not correctible by copyright.[20]

The division of copyright spoils is an instrument for regulating the relationship between packagers and distributors. Sometimes this is made visible (and audible) by a shift in circumstances, such as the Copyright Royalty Tribunal's recent award of substantially increased royalties to be paid by cable operators to the packagers of broadcast programming.[21]

It should be borne in mind, of course, that many of the larger copyright holders are "multiplayers"--information users and/or distributors and/or packagers all at the same time. That is true of the New York Times and of CBS, for example, which need prompt and unhindered access to information at the same time as they hope to limit access to its packaged form. How particular transactional conflicts may be resolved internally by these major organizations is not a matter of which the public is likely to become informed. But the comparative breadth of perspective of a "multiplayer" is something the Congress might usefully bear in mind when looking for advice and testimony on copyright policy.[22]

Other parties outside the direct chain of distribution may also be brought into the copyright compensation picture. The makers of duplication equipment, such as video cassette recorders or photocopying machines or computer tapes, may face a levy on the sale of their equipment as a kind of surrogate for the copying they make possible. This sort of impersonal, automatic or compulsory mechanism for recovery of fees is becoming increasingly prevalent as a means of payment for transactions--many of them entailing the use of new technologies--that might otherwise escape accountability.[23]

There are reasons for resorting to such techniques. They can supply a missing mechanism, as in the VCR case. They can overcome unmanageable transaction costs, such as those a cable operator would face if trying to negotiate a license with each copyright holder in each broadcast signal he carries. They can surmount bargaining inequalities, such as those of the songwriter facing the multitude of music-playing outlets. They can provide a boost in the market, as some think the low opening level of cable royalties did.[24]

That was an action of the Copyright Royalty Tribunal, a creature of Congress empowered to oversee a system of compulsory licensing. Under this system, a broadcast station or copyright owner no longer has the power to withhold licensing of its copyright. It has given that up, along with the power to fix or negotiate rates, in order to get a statutory determination that it has a compensable right at all. The CRT scheme was a compromise, and it has come in for some second thoughts. The Tribunal was given no staff and no standards by which to set rates, with the result that transaction costs for the parties have again become disproportionate and the economies of program carriage have become unforeseeable. Steps are now being taken in Congress to come to grips with these deficiencies.[25]

There are also blanket licensing mechanisms of a private nature, where the government support may take the form of antitrust immunity. Typically, the licensor is free to withhold his work from the market but once committed to any user it must be offered to all on previously established terms. ASCAP is a musical performing-rights society that operates in this fashion with all performing outlets; the Copyright Clearance Center is a recently launched collective licensing effort by publishers to collect for photocopying of their works by major corporate and research libraries.[26]

ASCAP also operates abroad, as do the Motion Picture Export Association and a satellite-cable licensing group known as AGICOA. All three are Webb-Pomerene associations, which means that they enjoy statutory immunity from U.S. antitrust restrictions. The licensing organizations deal like "private governments" with their foreign counterparts, and not with creators or distributors. Rates are subject to compulsory arbitration or adjudication if there is no negotiated settlement.[27]

Doubts and reservations have been expressed about the use of compulsory and blanket licensing. Some, like the Register of Copyrights, have warned about the potential for political manipulation of a government agency like the CRT, even if endowed with suitable staff and standards. He favors binding arbitration as a spur to privately negotiated settlements. Others have asked what antitrust supervision is available to monitor the power wielded by large private-rights organizations. All seem to agree on the need for improved assurance of an equitable return to creators. To this economic caveat might be added, again, a moral concern about the possible depersonalization and bureaucratization of the creative enterprise. That is something to which we will return.[28]

II. THE INTERNATIONAL ENVIRONMENT

A. Treaty Regimes

Copyright protection for eligible works is dependent on the national law of the place in which enforcement is sought, buttressed by international treaty provisions that simplify procedures and to some extent harmonize divergent laws. The treaties themselves are not the principal source of rights. They are instruments of comity, whose broad purpose is to "foster cultural exchange among nations and development of indigenous creativity."[29]

Until 1955 the United States refrained from joining any global covenants for this purpose. For its first 100 years, indeed, the young republic declined to recognize any copyright in foreign works or authors. Charles Dickens' angry complaints about American "piracy" of his works became legendary. At length the United States emerged from its cultural cocoon with the Chace International Copyright Act of 1891, extending copyright relations to any nation found and proclaimed by the President to afford adequate protection to American works--subject, as stated, to a domestic manufacturing requirement and various unfamiliar formalities in this country. Thus began an era of bilateral copyright relations that flourished until 1955 and for which there remains in force the underlying statutory authority.

Five years before the Chace Act was adopted, the U.S. declined to enter the Berne Convention of 1886 by which the major European states undertook to regulate their copyright relations.

From the beginning and throughout its numerous subsequent revisions and accessions, Berne has been and still is the premier instrument of international copyright, with the highest substantive standards and the widest membership. Administered with professional skill by the World International Property Organization [WIPO], Berne has never yet managed to attract the United States into adherence.[30]

The U.S. did join a Pan American Convention in 1910, along with 19 other American republics. The Buenos Aires Treaty, unlike most others, used the "full faith and credit" principle to extend recognition to copyrights duly awarded by other signatory states. (Normally, the practice is to open domestic copyright entitlement to works created elsewhere, regardless of their copyright or even their eligibility for copyright in countries of origin.) The U.S. joined this convention but never enacted implementing legislation and so is technically in violation of the treaty; the Convention is still in force, although its provisions have been largely superseded.[31]

The instrument that did that, finally, was the Universal Copyright Convention of 1952, to which the U.S. acceded effective in 1955. The UCC was created for the express purpose of bringing the United States into the international copyright community. Negotiated and established under the auspices of UNESCO, it provided a "low bridge" to the Berne Convention by a combination of minimal substantive requirements and the supercession of U.S. formalities by a simple "UCC notice" consisting of the familiar "c" inside a circle. Along with a "safeguard clause" designed to prevent Berne members from hiving off their stricter substantive obligations, these arrangements have made it possible for msot participating states to belong to both conventions.[32]

The line-up today finds 80 members in Berne, 75 in the UCC, and 52 countries that belong to both. The Berne-only states are predominantly in Africa, while the UCC-only states consist of the U.S. and Latin America plus the USSR, which joined the UCC in 1973. Of the remaining countries that belong to neither convention, the largest group is to be found in the Islamic Middle East where fundamentalist religious precepts are said to bar legal recognition of copyright.[33]

The Berne Convention as we have seen offers higher minimal protections than the UCC. The essence of the latter is very simple: (1) "adequate and effective" protection of copyrightable works, with (2) national treatment of foreign works. The Berne Convention offers more detailed and specific assurances, which would seem to be attractive to owners of American works. But the incentives of such owners to press for U.S. adherence to the Berne Convention have been diminished by the availability to them of both "back door" and "side door" entry into Berne. A back door is opened by simultaneous or first publication of a work in a Berne state, such as Canada, which gains for that work an eligibility for protection in all other Berne states. The side door became available upon U.S. accession to the UCC, since the 52 UCC members that also belong to Berne are obliged to offer national treatment, which for them includes the higher standards of Berne.[34]

This one-sided arrangement has not made the U.S. very popular in Berne states. In 1914 a protocol was adopted to authorize shutting the back door through member-country legislation. The threat has never yet been exercised. More recently, it is asserted that the 1976 revision and modernization of the U.S. Copyright Act has at last redressed the imbalance of comity between America and other states, by bringing U.S. protections up to world standard; but there may still be a residual resentment among other states against the "net taker" position of the United States over many decades.[35]

There have been other copyright conventions of more specialized application. The Rome Convention on "Neighboring Rights" extends protection to performers, record producers, and broadcast organizations. It contains complicated rules for eligibility and allows wide reservations to the principle of national treatment. The U.S. is not a member. This country does belong to the Phonograms Convention of 1971, which was adopted quite specifically to fight a growing problem of record "piracy." In its anxiety to produce results, this convention abandoned the principle of national treatment and enumerated the unlawful acts against which contracting states were to select and deploy enforcement measures. Dr. Gyorgy Boytha, the chief legal officer of WIPO, has expressed his hope that the world community will return to national treatment as a more flexible and harmonizing principle.[36]

That advice seems to have been disregarded in the only subsequent treaty to have been thus far negotiated, namely the 1974 Brussels Treaty on Satellite Broadcasts. This obliges signatories to prevent unauthorized distribution on their territory of satellite signals originating in another signatory state. Apart from its disregard of national treatment, this convention is noteworthy for the fact that it was developed primarily by the United States, which took ten years to submit it for ratification., This has been an embarrassment and a frustration to the public and private parties in this country who favor the treaty's adoption. At the same time, support has been developing for "Satellite Viewing Rights" legislation whose enactment would quite probably be inconsistent with the Brussels Treaty. This offers a reminder of the comparative merits of a national-treatment standard, which allows each country to come to a domestic policy settlement first before fixing on an international position.[37]

There are non-copyright instruments of national and international law that may be usable against unauthorized appropriators of telecommunications signals. The ITU Convention of 1973 obliges states to safeguard the integrity of telecommunications "correspondence", and the implementing Radio Regulations require the prohibition of unauthorized interception., A complying statute in the United States is Section 605 of the Federal Communications Act, which outlaws unauthorized publication of the contents of wire or radio communications. It has in fact been used to block satellite signal appropriation in this country.[38]

Another international instrument that bears consideration is the General Agreement on Tariffs and Trade. GATT is a trade mechanism that aims to avoid discrimination. It is not presently applicable to trade in intangibles, like rights to information; but there are strong forces in the U.S. service industries that are pressing for change. This gives rise to a general question, to be taken up later in this Part, regarding the overall basis and likely effectiveness of U.S. international information policy.[39]

The last major treaty of relevance is the Paris Convention of 1883, covering patents and trademarks and unfair competition. Like Berne and the UCC, this convention is grounded on national treatment. There are almost no minimal requirements, however, not even an express obligation to have a patent system; as for minimum duration of protection, which is creator's life plus 25 years in the UCC and 50 years in Berne, it would seemingly be enough under the Paris Convention to have a term of one year. Still, the world' patent and trademark systems congregate under the Paris roof, which today shelters 93 member states.[40]

One of the things that the new information technologies have done is to cast into fresh relief the respective domains of patent and copyright. This is perhaps clearest in the case of computer software and of semiconductor chip design, both of which have been pressed forward for copyright protection against strong contentions for either patent or sui generis treatment. We may begin with computer software.

Patent protection, as we have seen, is costly and uncertain and time-consuming to obtain. Therefore, although a patent would give much stronger defense to the interests of the proprietor, most creators of software and their assignees have been moved to seek copyright protection instead. This has led to a great deal of instructive litigation, including at least 24 cases in the last year in the United States alone. The weight of authority thus far has upheld copyrightability, despite cogent arguments that computer programs are really useful works suited to machine rather than human interactions, and that life plus 50 years is an inappropriately lengthy duration for the fairly rapid turnover of software and systems. The courts and commentators have been approving copyright even for programs in "object code", which is the language computers develop from human-produced "source code" for their own electronic convenience. There are, to be sure, practical arguments in favor of such results. Software increasingly is found on the very same discs that carry books and plays and other more traditional objects of copyright. The technologies for reproduction, and the transmission lines for distribution, are begoming interchangeable so that the works are effectively inseparable. So say the cognoscenti, and in this country they are prevailing.[41]

But not in Japan. Where American experts argue with almost theological fervor that computer programs are literary or scientific works within the ambit of Berne and UCC, hence exempt from compulsory licensing at least as between developed countries, their Japanese counterparts contend with equal fervor that software is industrial property covered by the Paris Convention and thus subject to compulsory licensing. To an outside observer unschooled in the intricacies of this disputation, it seems at least a possibility that computer programs are in fact a "swoose," partaking of certain qualities of both kinds of intellectual property and pertaining perfectly to neither. For either country to insist that its reading of the relevant treaties is the only one possible would be to tell other countries now making up their own minds that they have no discretion. That would seem undiplomatic and unhelpful.[42]

The case is different with semiconductor chips. The programs embedded in them may be and usually are subject to copyright protection to the same extent as other computer software. But the chips themselves, or more exactly their topography or configuration or spatial arrangement, have been promoted for copyright protection in their own right. WIPO and UNESCO have called for studies but taken no position as yet. The Register of Copyrights has stated his opinion that in this country a chip is a utilitarian work, outside the Copyright Act; the legislative history of the 1976 Act supports that view. So, although the U.S.Senate has approved legislation to amend the Copyright Act, the House version of the chips legislation takes a *sui generis* approach. It would base some of its concepts, such as originality, on copyright, but would reduce protection from 50-plus years to 10 and would shift from national treatment to reciprocity.[43]

A number of other countries are considering a shift from copyright to some sort of sui generis provision--including a shorter term--for software. Knowlegeable American Senators, concerned about the likely ripple effects from a Japanese statute or decree on software, have introduced a resolution condemning the Japanese threat. Again, it is a matter for political assessment whether such expressions are more likely to attract or alienate other governments, or whether they will think for themselves in any case.[44]

Those who do their own thinking, in industry or in government, in this country or abroad, will have to consider the possible consequences of copyright overreaching. The Director of WIPO, Arpad Bogsch, has stated that he thinks software is utilitarian and not a subject for copyright. The U.S. Register of Copyrights, David Ladd, has written that the creativity exhibited in computer programs and data bases and chip designs more nearly resembles invention than authorship; and further, that to stretch copyright to fit such invention may make it harder to gain acceptance of copyright among those governments that still resist it. This is a matter on which the U.S. holders of conventional copyrights may have an interest in making themselves heard.[45]

B. Gaps in Coverage

A clearly copyrightable work--a book or film, for example--may be denied international protection despite the regime of copyright treaties we have canvassed. This could occur because (a) the country in question does not belong to the UCC or have a bilateral agreement with the United States; or (b) its copyright laws on the relevant point are inadequate or out of date; or (c) it has no effective enforcement or remedial machinery. In some places, American information enterprises report, proving a case can be so costly and cumbersome as to constitute a practical denial of recourse. In others, the penalty for copyright infringement may be set so low that it serves as a less-expensive license fee. Not unnaturally, the entrepreneurs seek diplomatic and legislative support for vindication of their rights.[46]

Quite often they are justified. There are massive unauthorized uses of American copyrighted works, such as those that have been extensively documented by The International Federation of Phonogram and Videogram Producers and the Association of American Publishers. There are also, and often in the same countries, mass producers and shippers of counterfeit goods bearing bogus trademarks such as Cartier watches, Apple computers, and Eveready batteries. No sophisticated questions of legal interpretation attach to these activities. They are infringements pure and simple, and when unremedied they may justify a complaint of treaty violation.[47]

The industrial coalition that has been formed to din "piracy" into Congress' and the government's ear might want, however, to consider a little verbal circumspection. As Justice Stevens wrote for the Supreme Court majority in the Betamax case, "Even unauthorized uses of a copyrighted work are not necessarily infringing." There is fair use; there is public domain; there is reasonable policy disagreement. In the latter category falls the issue, for example of "Satellite Viewing Rights." That is the rallying cry of the Society for Private and Commercial Earth Stations (SPACE), now the Satellite Television Industry Association, which has consistently taken the position that the unlicensed reception of unencrypted satellite signals is legally valid: two bills, by Senator Goldwater (S.2437) and Congressman Gore (H.R. 5176) have now been introduced to confirm that view. The U.S. could not of course charge piracy abroad for what it authorizes at home.[48]

That observation applies even when laws differ but the foreign law is reasonable. Canadian cable systems, for example, pay no fee for the broadcast programming they pick up and deliver. The same was true of American cable systems before 1978, which makes it impossible to attack the Canadian law as inadequate. The bill introduced into the Senate at U.S. industry requrest on this subject seems simply ill-considered.[49]

But that raises another broad question for us, which is whether the "adequate and effective" standard of the UCC is a sufficiently weighty instrument of persuasion with which to approach foreign governments. Perhaps surprisingly, a good case can be made that it is. First, it is not difficult for interested private parties to construe it in a practical way. Does a particular country conform in its laws and practices to the major conventions and coverages, and does it provide real enforcement? These are manageable questions, that do not require a "piracy" charge.[50]

Under the UCC, "adequacy" is measured in terms of the rights and remedies afforded to creators by civilized countries. Similarly under the Paris Convention, it is conformity with "international norms" that is expected. These are akin to the "due process" standard placed in the U.S. Constitution to keep that instrument flexible and growing and attuned to changing perspectives.[51]

So, what first looks like weakness may turn out to be supple strength. Diplomatically, the "adequate and effective" clause is thought to civilize a *demandeur*'s posture by requiring him to appeal beyond power and sovereignty to the comity and common interest of nations. Experience suggests that this can be a strongly persuasive posture.[52]

C. "*Information Sovereignty*"

Against the appeal to comity and the law of nations there is arrayed a bundle of economic, social, cultural, and political impulses that can be loosely identified as expressions of "information sovereignty." In a rapidly evolving Information Age, governments and peoples seek some measure of control over the consequences of information moving in, from, and to their countries. Sometimes articulately but more often not so, they hope to maximize the benefits and minimize the detriments of information flow. Call the outcome information mercantilism, if you like; it operates at cross purposes with established regimes of information movement such as free flow and intellectual property.[53]

This is not just a phenomenon of the Third World, although copyright can easily get itself painted as a tool of cultural imperialism. A recent discussion paper on the subject of transborder data flows, prepared by the chairman of the OECD's Committee on Information, Computer, and Communications Policy, proposed the following points of agreement as among developed countries:

> "First, it is accepted by all member countries that the free flow of information has many positive effects....
>
> "Secondly, it is clear that the free flow of information must take place in an environment which respects the rights and obligations of individual nations."

It is this idea that nations, "sovereigns," have rights and obligations separate from and at odds with established legal regimes for information flow that seems to underlie much of the difficulty attendant on international copyright today.[54]

Part of this relates to the introduction of new information technology. Direct Broadcast Satellites and cable and cassettes are perceived as invading and potentially homogenizing hitherto separate cultures, by undermining national controls over broadcasting. A senior BBC official has recently complained that these technological intruders show "scant respect for existing markets, for national boundaries, for copyright and artistic properties"; he warns that "...we may all become Canadians now." This reference to cultural beleaguerment reminds us that technology can be used in the other way, as an instrument of retaliation, to facilitate the appropriation of incoming signals; and Canada is not the last to do that.[55]

The Third World has to some extent led the chorus by insisting on special intellectual-property dispensations. Many of the emerging countries succeeded to the Berne Convention by virtue of its prior adoption by their colonial powers, and they now assert the right to exercise their own judgments. In a stormy session in Stockholm in 1967, they pushed through a favorable protocol which, however, failed to win developed-country approval. To keep the treaty regime in one piece, both Berne and the UCC were modified in favor of Third World educational and development interests in 1971. There remain persistent pressures, thus far contained, to differentiate still further between the wealthier and the poorer countries. The Paris Convention on patents and trademarks has similarly been undergoing a painful revision process for over a decade, and if that comes apart some think its whole multilateral regime could be placed at risk.[56]

But the strongest determinant of intellectual property recognition, internationally, is thought by knowledgeable observers to be a country's trade position. If it is a major net exporter of information products and services, like the United States, there is accompanying support for copyright. If, like Japan, the country is struggling for export supremacy or, like most countries in the world, it is a net importer, then the impetus is likely to be the other way. This state of affairs looks and feels like 18th Century mercantilism, but it may not be even that straightforward. The trouble with "information sovereignty" is that it is not just economic but has deeply etched cultural and social and political facets as well. That is one basic theme of this report.57

It should be a familiar one in the United States, which only in recent years has become oriented towards information export. For most of its history the U.S. was not a respecter of international copyright and went to some lengths to avoid it. The manufacturing clause and formalities and the whole bilateral process can be seen as a cloak for the "piracy" of which Charles Dickens complained. Even today, the sheer size of the U.S. market makes it in absolute terms the world's largest and most thriving "piracy" haven.[58]

Now, of course, the interests of the United States are perceived differently. America is today the world's largest exporter of copyrighted works, both in general and in virtually every category. More literary works are shipped from the U.S. than from any other country; more revenues are earned, for films and television and music. The effects are not just financial but social and cultural, as any traveler with an ear and an eye can testify: The "American presence" is everywhere. That in effect is what provokes a good deal of the resistance.[59]

U.S. negotiators have reacted to this "information sovereignty" resistance in at least three different ways. One is to seek the up-dating or strengthening of multilateral agreements, as was done perhaps prematurely with the Brussels Treaty of 1974. Another is to secure bilateral agreements for copyright recognition and enforcement. This was done in the 1979 trade agreement with the PRC, which includes a pledge of "adequate and effective" protection for intellectual property. Bilateral investment agreements also typically contain an intellectual property clause, usually providing for national treatment but capable of dealing with specific problems when called for.[60]

These agreements, and continuing efforts to negotiate more, are built of course on a mutual interest that must first be located and identified. The Newly Industrialized Countries in the Far East, for example--Korea, Taiwan, Singapore, and Hong Kong (sometimes called the "Gang of Four")--have an apparent interest in becoming net exporters of computer software over the next few years. To that extent, they have an interest in assured international copyright. But beyond such perceived self-interest, there may not be very much ground for negotiation.[61]

To deal with these cases, the U.S. has recently deployed a third strand to its international armory, which might be labeled "coercive unilateralism." Industry interests favoring this approach have formed a coalition to go after notorious copyright "pirates" and to withhold, through U.S. legislation, trade or aid from countries that give them refuge. The Caribbean Basin Initiative, as a result, has been conditioned on proof of copyright compliance by the beneficiary countries--which has had the effect of empowering private U.S. commercial concerns to go out and negotiate the terms of statutes and regulations to be adopted by those governments. The General System of Preferences has been used to similar effect, and a statutory extension of the GSP using CBI-type language has been reported favorably in the Senate with the Administration's endorsement. Thought is also being given to modifying the Foreign Assistance Act along the same lines. In the meantime, teams of private or private-public complainants have gone out to various "pirate" states to demand governmental compliance.[62]

These tactics have not been uniformly successful. The Taiwan authorities pointed out that they were on the verge of losing their preferential status under U.S. trade law anyway, and intimated that this benefit is worth substantially less to them than the cost of paying copyright royalties. The Singapore government was reluctant to meet with the copyright posse and showed active hostility, perhaps because it didn't like being considered as "the world capital of piracy." Jamaica and the Dominican Republic on the other hand capitulated, which leaves only the political costs to be considered.[63]

The Dominican Republic was the home of substantial unauthorized photocopying of American textbooks, to the point where legitimate importation ceased. Official copyright relations with the United States were governed by the Buenos Aires Convention of 1910, which as we have seen is of marginal effectiveness. Dominican law did not stop the practice, in part because of weak remedies. Counsel for the AAP succeeded in inserting into the Caribbean Basin legislation a condition that trade preferences should depend upon:

> "The extent to which such country provides under its law adequate and effective means for foreign nationals to secure, exercise, and enforce exclusive rights in intellectual propery, including patent, trademark, and copyright rights."

The AAP then petitioned the Office of Special Trade Representative, successfully, to designate the Dominican Republic as subject to this condition; and it took a leading part, through counsel and an ad hoc coalition of major book publishers, in negotiating specific pledges of legal and legislative change from the Dominican government.[64]

Some of these changes are plainly salutary, but others raise disturbing questions. The Dominican Republic, as a direct result of the negotiations, has joined the UCC and has introduced implementing legislation after several drafts had been scrutinized critically by the ad hoc U.S. coalition. On the criminal side, the Dominican pledges include the following language:

> "The Government of the Dominican Republic will give full assistance to U.S. publishers...in bringing criminal actions... [It] will support pretrial seizure of pirated books and plates based on a complaint filed with the Attorney General or other competent prosecuting attorney."[65]

Considering that a typical trial in the Dominican Republic may be expected to take three years, and bearing in mind that the defendant in any given case may be innocent, what is to be said about such seizures? Would they survive a First Amendment challenge in the United States? Also, and again on the presumption of innocence, what is to be said of a prosecution inspired by the hope of economic favor (here, duty-free entry of rum) from a foreign power? Would this survive a Due Process challenge in the United States? And if the answer to either of these sets of questions is no or doubtful, are these the sorts of values we want to be exporting from the United States?

In Jamaica it was the mandatory section of the CBI that became applicable: no eligibility

> "if a government-owned entity in such country engages in the broadcast of copyrighted material, including films or television material, belonging to United States copyright owners without their express consent."

That section was written for, and described accurately, the operations of JVC, the government-owned broadcasting corporation that was taking HBO pay-television films off an American satellite signal and rebroadcasting them around the island with no copyright payment. This time it was theatrical exhibition of American feature films that dried up. Jamaica had and has no copyright relations with the United States, and the government as sovereign was immune from private suit for misappropriation. So the private parties in interest used the designation process to secure a letter of capitulation from the Jamaican government. It too pledged entry into the UCC, and offered meanwhile reciprocal enforcement of rights to U.S. nationals. The letter is not subject to the same doubts as is the Dominican pledge. Yet it has had a less than happy outcome. The U.S. Motion Picture Export Association entered into negotiations for a license to JVC, but not for the feature films its audience had grown to fancy. In response, JVC is said to have recently pulled down three or four feature films and distributed them. MPEAA has in turn lodged a protest with the Department of State at the political level, and mandatory withdrawal of CBI status from Jamaica is suddenly possible.[66]

One wonders if that is in the overall political interest of the United States. The previous Prime Minister of Jamaica, Mr. Manley--generally regarded as unfriendly to the United States --may be heartened, but presumably the President of the United States if he found out would not be. The same sort of question arises with regard to Singapore, a vital maritime and financial and commercial hub and a central element in the ASEAN group of nations with which the United States has been forging closer ties. Private publishers have been calling that country a "world capital of piracy" at the same time as they have had to concede that American books have not been made available in the Far East at prices that are affordable in the region. Do we really want to let private interests of this sort dictate public outcomes of such significance? It seems doubtful.[67]

There are other policy reservations of a similar nature. Tying trade preferences to copyright performance, as with the GSP, may be found contrary to the GATT and so may prejudice any chance we have of broadening that instrument to cover services. But the main concern relates to the recoil effect of shooting at friendly or valued partners. Speaking on a personal basis, an officer with the Special Trade Representative has said that "withdrawing benefits is not always the best way of bringing about changes in copyright practices....Retaliation can shoot ourselves in the foot."[68]

To be sure, there is precedent for using economic leverage. The French did it in the early 19th Century, when domestic censorship led to Dutch and Belgian publication of works by French authors. The practice continued, without the authors' consent, after the end of censorship. France retaliated by threatening non-renewal of trade agreements and this led to a copyright accord. The same tactic was used thereafter against Austrian and Swiss reprints.[69]

America probably enjoys the same relative economic advantage now that France displayed then. But there are at least two differences. In the early 19th Century there was no copyright convention of any sort; and France at that time, unlike the United States since, was building a record of leadership in granting and promoting international copyright.[70]

It is in fact remarkable to consider how far the U.S. has traveled from unilateral avoidance of international obligations to unilateral imposition of them on others. Now cast as a "leading champion of intellectual property," the United States must remember that for a century it was a virtual outlaw and for a half century an outsider--not one in a position to adopt a posture of moral outrage against "pirate states."[71]

The shift to coercive unilateralism bespeaks a certain loss of confidence by American copyright holders in the international environment. But the U.S. experience with multilateral instruments is still of very recent origin. It is perhaps too early to give up, or to plant a memorial for America's try at the international community, "1955-1985 R.I.P."[72]

The other alternative of course is a return to bilateralism, perhaps based on the continuing authority of the President to proclaim reciprocity. This could offer a more polite and dignified way of exercising economic leverage. But it would still entail working for narrow and immediate national goals, rather than using the undoubted strengths and capacities of the United States to build a sustainable world order in the clear long-range interest of this country. That is the concern being expressed in the GATT context now, where the U.S. seems to be shelving the hard task of multilateral negotiation in favor of piecemeal bilateral efforts on trade in agriculture, high technology, and services. This is not being taken as a productive move; on the contrary, the West German Economic Minister warned recently in Washington that a return to bilateralism "could do harm to the international principles of free trade."[73]

Economic leverage may sometimes seem the only available method of pursuing copyright enforcement. Too often, however, it appears to be applied against poor countries with some respect for intellectual property rather than against the small circle of healthier countries with little or no such respect. It does not look good, or breed good relations with the Third World, for the United States to use strongarm methods in the Caribbean that cannot be employed in the Pacific., If economic leverage is to be used, moreover, its limits might more properly be set at procuring membership in the UCC or Berne. Once a Jamaica or a Dominican Republic signed on to a copyright convention in this suggested system, the economic plum would be awarded. That seems a constructive approach, and one that would allow the de-linking of more particularized private negotiations (which could continue) from the taking of official U.S. decisions.

For copyright enforcement activists, this might look like a short-term setback or impoverishment of resources. But it may be questioned whether a regime of coercive unilateralism is really in the best long-range interests of the broad community of American creators and packagers and distributors and users of intellectual property--a community much broader and deeper than those who have been active. One question for consideration, indeed, is who in our system of government can best understand and represent that buried interest.[74]

America as the world's leading Information Society has arguably been giving its interests short shrift. Notably, the "muscle diplomacy" we have been describing occurs at the same time as a number of other U.S. actions that, taken together, could look like a retreat to information insularity: the GATT finding on the manufacturing clause; the withdrawal from UNESCO; the turn away from INTELSAT. The U.S. must decide whether it wants really to participate in the international information community, and whether it is prepared to begin to exercise its natural opportunity for constructive leadership.

III. STAKEHOLDERS

A. Intergovernmental Agencies

When the U.S. announced its withdrawal from UNESCO at the end of 1983, it did so in fair measure because of that organization's championship of a "New World Information Order," in opposition to the perceived interests of American media and information industries. UNESCO is also the home of the UCC and provides its secretariat. Yet the "NWIO" controversy stirred up in the Culture and Communications sector of UNESCO has not to date spread to the 18-nation UCC Intergovernmental Committee, on which the interests of the U.S., USSR, and other developed and developing nations are kept attentively in balance.[75]

The IGC secretariat meets regularly with its WIPO counterpart from the Berne Convention. That group is dominated by persons of Hungarian origin, yet there is no apparent concern about a hidden political agenda. The U.S. is familiar with WIPO through its superintendence of the Paris Convention on patents and trademarks; and the view of the U.S. Patent Office is that WIPO is a serious professional organization, subject to some buffeting from Third World politics but not by any means an arm of the Eastern bloc.[76]

The IGC and Berne groups sit together regularly to review the operation of their respective treaties and to consider challenges such as those presented by new technology. The process is slow and methodical, affording room for views that conflict with each other and with those of the secretariats. Typically the groups develop policy recommendations at expert committee level, subject to their own later review and ratification.[77]

Other UN organs have been more rambunctious in appearance if not in actuality. UNCTAD, a Third World-oriented development agency, has looked to some of the developing countries as a possible alternative to the Paris Convention--a way of breaking the Western "monopoly" on industrial property; but, although threats have been made, nothing has happened. There are also long-running efforts in more than one UN agency to develop a code of conduct for technology transfer, which if adopted could affect patent and copyright licensing practices. Here again, however, nothing definitive has yet occurred.[78]

In the Western camp, the OECD has tried to steal something of a march on the Third World by developing its own technology-transfer Code of Conduct. No real impetus has been supplied for this effort, apparently, so that after much discussion "everything is tied up in brackets." The OECD is of course the post-war source of principles to govern trade in "invisibles," which includes intellectual property.[79]

B. Selected National Governments

The moving parties--that is, the visible actors on the international copyright scene--are the nation states that either do or do not subscribe to a multilateral treaty, and either do or do not agree with the present U.S. view of proper copyright practice.

One that did not agree, at first, was the Soviet Union--which, today, takes with its Comecon partners a quite business-like view of intellectual property. That is a change. The Soviet government renounced intellectual property after the 1917 Revolution, as a tool for capitalist exploitation of the creative artist. For fifty years thereafter, the Soviets pursued a policy of "strict isolationism" from international copyright. During this period, the USSR was called "the world's most active literary pirate" (evidently, a transferable citation). Conan Doyle's and Jack London's works were published freely, with no royalty payments. At the other end, Boris Pasternak's "Dr. Zhivago" gained both the Nobel Prize and substantial book and film royalties for its author when the manuscript was smuggled out for publication in Italy, a Berne Convention state.[80]

What finally tumbled the walls was a Soviet thirst for Western technology, which it determined could not be obtained without license and payment. So, in 1965, the Soviet Union joined the Paris Convention. Then in 1972 at the Moscow Summit, Soviet authorities were advised that the price for a U.S. Tax Convention they wanted was accession to the UCC. The Soviets joined, effective the following year.[81]

Since then the Soviets have become adept at building up a network of agreements with foreign collecting societies, which --according to knowledgeable observers--are being "meticulously honored." Their initiation into international copyright has undoubtedly been aided by other Comecon countries holding long and sophisticated pre-Comecon experience in the field. Hungary, for example, has supplied the leadership of WIPO not by politics but by professionalism.[82]

Turning attention across the pole, Canada may be examined next as a neighbor and ally and friend that sees itself however as living in the cultural and economic and political shadow of its partner to the south.. ("We may all become Canadians now," intones the BBC .) While Canada is a member of the UCC as well as Berne, its government is often at pains to separate itself from whatever the prevailing American view of copyright may be.

Thus after the U.S. had changed its domestic law to attach copyright liability to cable carriage of broadcast signals, Canada stayed with the old law--as it was legally entitled to do. Thus also, after a long and noisy and still unsettled furor over trans-border broadcasting, the Canadians authorized an entity called CANCOM to pick up the signals of the three American networks and PBS at the border, send them (with Canadian advertisements) to a Canadian satellite, and deliver them to frontier settlements, all without any royalty payment to U.S. proprietors. On this issue, assuming the UCC were in point, Canada would appear almost to be claiming the kind of special dispensation afforded to developing countries by the 1971 revisions to that treaty. In fact, however, the UCC seems not to speak to the point.[83]

On the software question, Canada has not agreed fully with

Japan but it does not support the U.S. position either. In 1982 an official study recommended copyright protection for all programs, just as in the U.S. Two years later, however, the Canadian White Paper on the subject came out and proposed (1) full copyright protection for programs written in human-readable form ("source code") ; but (2) sui generis protection of five years only for machine-readable programs ("object code".) The latter protection is to be made available to foreign works under the UCC and Berne, not by right but "as a matter of largesse."[84]

Most West Europeans, on the other hand, have gone along with the U.S. view of things--at least on the new-technology front. We pay them particular attention because of their industrial might, their economic and political kinship with the United States, and their much longer experience with international copyright.

In the U.K., the position on software is to favor copyright protection of both human- and machine-readable programs under existing law, with no new statute. In France, albeit a civil-law country with a long tradition of emphasis on human creativity, the result thus far has been the same. Programs "accessible to human intelligence," the courts have held, are copyrightable even if technical sophistication must be employed. Chips, by contrast, are viewed as industrial property (a position similar to that taken by the U.S. House of Representatives)--although, even here, programs embodied in the chips remain copyrightable.[85]

In Germany and Italy the law is still unfolding. An Italian video game decision moves along the common path but is not dispositive. Two judgments in the FRG have looked in contradictory directions, but they have since been overtaken by a 1982 decision holding VISICALC to be a literary and scientific work and hence copyrightable. There was language in the opinion requiring a degree of personal creation, which could create difficulty when an "object code" case is reached, but that has not happened yet.[86]

There is some effort in the EEC to take the lead in forging a distinctly regional view of copyright--one that would safeguard the European cultural heritage, and promote further harmonization of laws. Thus far, it has produced a spate of studies but no effective action.[87]

Moving to the other end of the world, while still in the OECD, Australia is a valued U.S. trading partner and also a member of the UCC. On the software question its higher courts recently grappled with "object code" and held it copyrightable--in an opinion that split three ways and therefore provided no solid guidance for business or investment planning. The Attorney General of Australia then submitted legislation, since approved, to treat all computer programs as protectible works whether source or object code. A high-level policy review has also been promised, which some observers believe could lead to recommendations for a *sui generis* law.[88]

In Japan, another OECD and UCC member and a self-proclaimed rival to the United States for information-technology leadership, that recommendation has been fully made. The Ministry of International Trade and Industry published a proposed *sui generis* law on December 6, 1983. It took the position that no patent, copyright or trade secret protection was appropriate for computer software of any kind. Instead, a new system was offered with protection for up to 15 years. The conditions proved very controversial. Any software sold in Japan was to be subject to a compulsory license in favor of anyone designated by the Japanese Government, and at officially prescribed rather than market rates. This was troublesome enough to American computer firms, but there were also two other disquieting features.[89]

First, the patent precedent for compulsory licensing cited by MITI is not really relevant: Patents can be claimed only if they are not being licensed or worked in a given country, and then only after a lengthy notice period such that, in practice, the patent compulsory license is never exercised. Here Japan proposes to compel a license even though the software is being actively sold and used in the market. Second, the MITI proposal would empower a licensee who modifies the software to turn around and sell it in direct competition with the American originator, even though that firm may have invested millions of dollars in creating the software. This at least is the way that affected American businessmen are reading the Japanese proposed law.[90]

We may never get a clarification of that reading, because it now appears that the MITI proposal as such is dead. It was opposed by the Ministry of Education, and under Japanese consensus traditions that is enough to block legislative action in the Diet. Still, the fate of this particular law may be less important in the long run than the motivations underlying it. The Japanese Education Ministry has customarily exercised responsibility for copyrights, and MITI for patents. Now for the first time the agreement is that MITI will attend all international copyright meetings along with its sister ministry. What is the likely, unstated agenda? Many observers believe it is to help bootstrap Japan, now well behind the U.S. in computer software into dominance of this field. If that is so, then indeed we could be embarked towards a course, ultimately, of economic Darwinism --of "nature red in tooth and claw"--that would bear little or no relation to the civilizing traditions of intellectual property.[91]

What happens in Japan is important in itself and also for the effect it may have on the laws and practices of other countries. Nowhere is this more true than in the Newly Industrialized Countries (NIC's) of the Far East. Sometimes labeled the "Gang of Four," or something less complimentary, these countries are the object of close attention by American copyright proprietors.

The U.S. Department of Commerce recently organized an interagency task force, with Copyright Office and industry participation, to visit Taiwan and South Korea. The governments of both those countries were told directly to give up any thought they might have of studying the MITI proposal. These countries of course, along with Hong Kong and Singapore, have a history of housing and exporting unlicensed reproductions of copyrighted works. Like the Japanese, the NIC's are also believed to harbor hopes of becoming substantial net exporters of computer software within the next five years. That may give them an interest in stable and reliable copyright relations for software, but as yet they have expressed no interest in taking special steps to root out infringements of other works.[92]

None of the four Far East NIC's is a UCC member in its own right, and Hong Kong's derivative status is in the process of being shifted from the UK (which is a member) to China (which is not). the U.S. will presumably take some interest in the terms of that transfer, including its treatment of intellectual property.

In the Caribbean, the two countries we have examined are in the process of joining the UCC. Jamaica provides an example of what can happen with satellite "spillover": The country lies under the shaped signal beam of a domestic U.S. communications satellite, and its earth station picked up the programming that was dangling before it. There are legislative proposals in the United States, as we have seen, that would legalize such activity. As for the Dominican Republic, it furnishes an illustration of the fugitive nature of intellectual property--in this case, American textbooks moving to Mexico for translation and then to the DR for cheap duplication. In that country, the pertinent thing to watch will be the actual course of conduct under the laws negotiated into being by private American interests.[93]

In Latin America, the prominent country for copyright purposes is Brazil. Like Japan, and like most of the larger countries in the Western Hemisphere, Brazil is a UCC member. Also like Japan, it aims to carve out a significant place for itself in the computer and software markets of the world. Because it is a NIC rather than a fully industrialized country, Brazil pursues its objectives under an "infant industry" rubric. But its techniques are somewhat similar to Japan's: it is examining a draft sui generis law for software, with compulsory licensing provisions it already restricts imports of hardware and software to those that will not compete with domestic products; and it is proposing to authorize unlicensed duplication of imported software that does enter, if that is in "the national interest" --which is effectively no protection at all.[94]

Brazil has been playing the role of Peck's Bad Boy in the information markets for several years now, provoking a good deal of discussion but virtually no imitation. That will bear continued watching, of course, particularly with the Japanese initiative as a companion. But there seems room now to move beyond reflex to reflection, engaging the Japanese and the Brazilians and others in the kind of measured, statesmanlike debate that UCC and Berne procedures make possible.

In the Islamic Crescent, such a course may not now be possible. The oil-rich nations of Kuwait, Saudi Arabia, Iraq, Iran, and Libya among others in this region have the wherewithal to import Western writings and films, music and television programs, and other types of intellectual property. Yet these countries do not belong to Berne or the UCC, and they have no discernible foreign copyright laws on their books. (In the U.S. Copyright Office, they are listed as having "no" or at best "unclear" copyright relations with the United States.) It is said that Islamic fundamentalism, of which there has been a notable resurgence in recent years, prevents legal acknowledgment of graven images. More likely it blocks overt acceptance of Western culture on any terms. What the national laws of these various countries may actually provide in the way of copyright protection, probably under other names, is a question that, so far as appears, has yet to be systematically explored. On a practical level, the entry of Islamic nations into acknowledged copyright relationships with the West may be something that has to follow, rather than precede, a cultural and political rapprochement.[95]

There is also a need, finally, for improved understanding and cooperation between North and South, that is--with Third World countries generally . Many of the developing countries, as we have seen, succeeded to copyright obligations adopted for them by their colonial powers. As a part of their emancipation, and in exercise of the bloc voting power these countries have gained in multilateral forums, they tend to seek special privileges and exemptions. Thus for example anonymous works of traditional art--folklore, in common parlance--have been put forward by LDC's for special copyright treatment. There is a case to be made for safeguarding cultural patrimony, and many countries of both North and South do that. But to bend copyright to this purpose is to overlook the fact that with folklore there is no identified artist to compensate; that the works are usually in the public domain; and that the effect of such an extension is to block a Picasso from portraying an African mask. That is not any sort of balance between creator and user.[96]

More severe pressures by far have been brought to bear on copyright by the LDC countries, particularly at the Stockholm Conference of the Berne Union in 1967. That occasion is described by U.S. observers as a terrible experience, leaving the LDC's frustrated, the developing countries (particularly the UK| intransigeant, and the U.S. ineffectual. A protocol was eventually drawn up but was not adopted. That was the beginning of a sustained and serious Third World pressure for revision that has gained a measure of success but that--in some estimations at least--continues in force today.[97]

In 1971 both the UCC and Berne Conventions were revised to permit special classes of compulsory license for specified LDC educational and development purposes. A Tunis Model Law was drawn up shortly thereafter, with WIPO/UNESCO assistance, to guide conformity with the new revisions. Despite all the attention, very few countries have adopted it.[98]

Very few seem to have turned away either from the cause of intellectual property revision. On the patent side, the Paris Convention (itself amended at Stockholm in 1967) has just gone through a protracted effort at further revision for more than a decade, and is still adjudged by U.S. participants to be bordering on a possible split-up into developed- and developing-country factions. The expectation is that there will be an agreement. But from the businessman's point of view, dealing with Third World countries on intellectual property has become a painful exposure to special demands--for patent indemnities, for disclosure of trade secrets, for trademark payments--that amount to a virtual deprivation of familiar protections. As a part of this inhospitality, it is the testimony of U.S. information-industry negotiators that Third World countries regularly seek copyright compulsory licenses beyond the purposes sanctioned in 1971.[99]

There is another perspective. According to the former Director-General of IFPI--the chief international representative of the video and record industries from 1960 to 1979--the LDC compulsory license provisions adopted in 1971 were intended to give copyright owners an incentive and an opportunity to strike deals in the developing countries before those provisions took effect. His testimony is that workable, practical arrangements did in fact evolve without resort to the compulsory licenses. Perhaps U.S. industries were less well-informed than others about these opportunities, or were not at that time as concerned with Third World markets.[100]

There is something else to be said. The U.S. in the late 1970's succeeded in turning completely around a concerted Third World effort, inspired and abetted politically by the Soviet Union, to impose state censorship on the international mass media. The turnaround was acocmplished by focusing on the real source of Third World frustration, which was the inadequacy of their own communications infrastructures, and by moving to alleviate that frustration through a clearinghouse mechanism that came to be called the International Program for Development of Communications (IPDC). What worked then should be relevant now.[101]

Third World countries may be uncomfortable with intellectual property, at least in good part, because they did not invent it and because they have no settled tradition of administering it. To them it may seem an exotic and perhaps a menacing plant. But that is a conception that can be changed through greater familiarization. Senegal had a poet president, Sri Lanka is the home for Arthur Clarke's Space Odyssey, Colombia boasts Garcia Marquez. Every country has its infrastructure for information dissemination, from the griots of Roots to the earth stations of ArabSat. It is just a question of recognizing functions, and of gaining familiarity with their operation. Besides, intellectual property promotes the two-way exchange of cultures. Copyright can serve a mutual interest.

WIPO and UNESCO have in fact undertaken to help Third World countries pursue their interests through model contracts, a clearinghouse of available works, legal advice and assistance, and some study fellowships. More of a focus on the understanding of information transactions, and on building distribution infrastructures, along with guidance to entering developed-country markets, would seem appropriate and in keeping with the IPDC initiative.[102]

That is not likely to happen without U.S. leadership, both in the UCC intergovernmental Committee and here at home. The U.S. at present has, remarkably, no copyright or patent training programs of its own for Third World visiting fellows, despite the high professional skills available here and despite the clear self-interest this would serve over the medium and longer term. The Patent Office has provided some training for WIPO at WIPO expense, but the Copyright Office cannot follow suit because the U.S. is not a member of the Berne Convention. Some 4-10 trainees annually have benefited; that is all.[103]

This is a drop in the bucket compared to what the Europeans and Japanese regularly do, which is to bring over about two dozen trainees at a time for five weeks of fully paid training. Once again, the country with the largest interest at stake--the U.S. --does the least in this vein to promote them. Continuation of such lassitude may put the U.S. on the road to disqualifying itself from complaining about Third World actions and attitudes.[104]

C. American Enterprises

These are the firms and associations that pull the levers of U.S. policy-making or that let them be pulled in certain directions by inattention. We have seen the enforcement activists --book publishers, broadcast programmers, and others--who have taken the opportunities presented by trade-preference legislation and by trade delegations to exact compensation for their information exports. The short-term private results are striking, the longer-range public consequences not yet registered.

Other information industries have taken varying stands on foreign appropriation of copyrighted works, often within the same sector. Among distribution companies, CBS takes a severe view of the subject. In a task force report to be delivered shortly to the U.S. Special Trade Representative, Chairman Tom Wyman will report that copyright infringement is perceived as the Number 1 export barrier. CBS and American Express and a number of other major companies are anxious to get GATT modified so that it covers trade in services. (There seems little present prospect of success within GATT on this objective.) CBS also believes that the GSP trade-preference lever should be used against copyright-delinquent LDC's, at least as a short-term incentive to broaden and strengthen treaty observance.[105]

The National Cable Television Association, at the other end of things, has not yet put international copyright on its agenda--even though its cable-programming members (such as HBO, ESPN, and Turner Communications) have been moving vigorously to line up contracts with the new cable systems being built in Western Europe. Their turn may come.[106]

The New York Times is in an interesting middle position. It is one of the few newspapers that relies very much on copyright. Much of the news it distributes is of course in the public domain. A great deal of the rest is highly transitory. But the features that help distinguish the newspaper--crosswords, cuisine, financial, fashion--are less perishable and are copyrighted. The Times has a News Service for these features that is licensed abroad. Occasionally it is "raided" by a foreign newspaper or publication. The Times finds that a polite reminder, by local counsel, of the proprietary nature of the work is usually enough to induce a cessation.

There is also a New York Times Information Service, which the Times used to retail itself before tiring of the burden. It is a computerized retrieval service based on past issues of the paper. Copyright displays are posted prominently on both the terminal's screen and on hard copy. Nevertheless there have been real problems of computer appropriation by a technique called "downloading," which enables massive theft of the service. The Times was not concerned about casual, odd-lot copying or entry into the system by adolescent "hackers." It determined that "downloading" is a major operation manageable only by large, wealthy, and sophisticated operators. The Times responded at first by inserting "flags" into the data--false information that would show up in a purloined text. Later still, the newspaper decided it was not really in the data marketing business and it licensed the distribution to a company that is.[107]

The user community does not champion theft but it does serve as a reminder that "public domain" is something more than the passive remainder left over after "intellectual property" has had its sway. The American Library Association stresses the importance of information interchange to a vibrant society. As new technologies speed up and expand this interchange, the ALA believes we may need new techniques and new concepts to maintain the balance of interests between distributor and user. It invites some fresh thinking in this field.[108]

The computer hardware and software producers--IBM, CDC, CBEMA, and others--seem to be willing to accept that challenge. They have a great deal at stake in foreign markets. Still, they have shown they are prepared to work with foreign governments and international organizations. In negotiation, they tend to think and speak about the other fellow's interests. While these firms display a willingness to consider new copyright approaches, they also remind their interlocutors that technology and product convergence have come to mean that one cannot practicably split old works from new. Overall, this sector of the information industry appears to take a more sophisticated and long-range view of the challenge than most.[109]

CBEMA has a Proprietary Rights Committee that could have something to offer to Copyright Office and Executive branch policy deliberations, if called upon in a systematic way. So might the Industrial Property Committee of the U.S. Council on International Business, which is the U.S. arm of the International Chamber of Commerce. Both enjoy wide information-industry participation, beyond the customary scope of the "enforcement activists." The pertinent contacts are as follows:[110]

CBEMA Committee Chairman
H.M. Brownrout
Patent Counsel
XEROX Corporation
Corporate H.Q.
Stamford, CN 06904
(203) 329-8700 x3106

U.S.C.I.B. Committee Chairman
William D. Roberson
Associate Patent Counsel
Polaroid Corporation
549 Technology Square
Cambridge MA 02139
(617) 577-2218

D. General Public

Intelligent interplay of lobbying interests should help improve policy definition; but the policy itself is absolutely dependent for its continuance upon public understanding and support. Senator Sam Ervin likes to remind his audiences of "the truth taught by Sir William Blackstone in his Commentaries on the Laws of England that government cannot enforce any law with effectiveness unless the general public favors it." The evidence of the Xerox machine is that the public neither knows nor cares very much about copyright enforcement. The law of intellectual property deals with the misappropriation of immaterial rights, which is far less obvious or rooted in common experience than ordinary theft. To the esoteric nature of the wrong is now added the ease and convenience of high-technology reproduction, which the average citizen is unlikely to condemn.[111]

There have been notable efforts in recent years to engage spokesmen for the public in policy review. CONTU "sought to consider how the interests of the general public and the ultimate consumer may be affected," by commissioning public-interest analyses and seminars and presentations. More recently, a Congressional symposium on copyright and technology featured prominent generalists willing to challenge enforcement or champion the public domain or both. This seems the right approach to take; for unless intellectual property can surmount policy skepticism, it is not likely to survive.[112]

IV. TRENDS

A. General

The Information Age is characterized by certain general tendencies that impinge on intellectual-property protection. Internationally, there is the increasing interpenetration of economies and cultures, the erosion of "foreign-ness" brought about in good part by the expanding number and scope of cross-border information transactions. There is also the perceived divergence in the terms of access to information markets, as between the industrialized and developing countries. And, in addition, there is the growing size and importance of international trade in information goods, technologies, and services.

Such broad considerations doubtless affect the political climate in which copyright and other information policy questions are perceived. They prompt a sense of consequentiality, reflected in phrases like "The Information Age." As guides to policy, however, these general observations are limited by their generality: They are headlines, not text. Granted that information relations are complex and growing, where does that lead us? We need more specific, focused measurements. And we need to beware falling prey to mere quantitative bemusement, once the figures are in hand. It is the _quality_ or _resonance_ of information transactions that determines their impact and their governability. The place to begin appreciating that, once again, is at home.

B. Economic

The CTA Work Statement speaks in various places of the changing value of information, without defining what this means. None of the persons interviewed or sources consulted for this report could cast any light on the question. It may be a matter for an economic specialist, but it also has relevance to domestic and international policy generally.[113]

Information exports are plainly of critical importance to the U.S. balance of trade and payments; but it is impossible to describe the trends with confidence because the underlying documentation is unreliable. The Copyright Office has undertaken to produce by the end of the year a census of domestic and international flows of information, and to keep it up to date on an annual basis thereafter. There already exist some privately produced time series of information transactions among selected markets. But any such reports are and must be based on Standardized International Trade Classifications (SITC), which are woefully out of date. (They do not, for example, include any category for "data bases.") It seems likely that further and more fundamental efforts will have to be authorized and funded before the U.S. can document with real usefulness its own stand ing as the leading exporter of information goods and services.[114]

C. Social

A considerable amount of information and opinion has been uncovered in our research on the so-called "depersonalization" of creative transactions. Author John Hersey warned feelingly in his CONTU dissent of the humanistic perils of treating machine-created works on the same basis as man-imagined works. To some extent this debate carries back to the "copyright vs. autho's right" distinction we examined in Part I. It also relates to the bureaucratization of creative compensation, by both public and private agencies, that was touched on there. This is not just an issue of compulsory or blanket licenses, however, or even of "works for hire." To look at today's group contracts between producers and actors and writers and directors and other creative people in the film and television industries is to step a long way back toward the era of medieval craft guilds. It reflects a seeming reversal of Maitland's famous dictum that the history of the law has been a progression from status to contract.[115]

Very likely the regression--if such it is--is a sign of America's lingering post-Depression preference for security over adventure, and is not particular to copyright. (President Reagan would have made his own contribution to the trend in his stint at the helm of the Screen Actors' Guild.) Nor is it clear that the "depersonalization" of copyright need occasion any more than a misplaced nostalgic snuffle. Incentives for creativity, whether by grant or fee or tax allowance, have always operated on the impersonal economic side of the ledger. Beethoven did not set down the opening notes of the Fifth symphony because of copyright; he set them down because he had to. What copyright helps determine is whether there will be a Sixth Symphony, or a fifth-generation computer, or finance for the next low-budget film director.

A different question arises about the necessity for control over a copyrighted work. Traditionally the creator and his assignees have been entitled to refuse permission to copy or perform a work. That is at the conceptual heart of "copy-right", and in practical terms it allows the sequential ordering of markets in such a way as to maximize the financial return from licensing. Nevertheless the control right is now the hardest one to square with the facts of widespread reproduction technology; and as we saw in Part II C, it has also been at the root of probable over-reaching in America's copyright relations with smaller countries. Thought should therefore be given, some believe, to shifting the basis of copyright from control to compensation.[116]

Finally on the social front, the spread of information technologies is threatening to create an "information underclass" --those without the means or the education to operate a personal computer, access a data base, qualify for a high-technology job. Charges for public-library technology use, which financial considerations may make necessary, could intensify the discrimination. The consequences of consigning whole classes of people to rote functions, as in Huxley's Brave New World (where "Epsilon Semi-Morons" operated the elevator banks), are of course horrendous. But again it is not clear what, if anything, copyright can be expected to do about it. Intellectual property is a creature of market economics and should stay associated with it. Welfare economics, subsidized by the general taxpayer rather than the happenstance proprietor, is another matter.[117]

D. Technological

This will be addressed at length by others, but as the topic is relevant here we may set down one or two notes. There are more and less helpful ways of stating the impact on copyright of new technologies. To say that they "globalize the information market", as some commentators do, is not particularly useful. Foreign markets have been in the ambit of copyright since a Danish decree of 1828. At the Congressional symposium on this subject in early 1984, the matter was put more pointedly: "The new technologies have dramatically escalated the degree to which copyright uses today may go undetected and uncompensated." That is a useful statement.[118]

The second point is that new information technologies can also provoke non-copyright pressures that, if left unresolved, may adversely affect the climate for copyright. Examples of this are "satellite trespass" by unconsented DBS broadcasts and by remote sensing, perceived and resented by many nation-states as an infringement on their sovereignty.[119]

E. Keeping Pace With Innovation

The law and its institutions have been hard pressed to keep up with the rate of technological change, illustrated by the government's antitrust case against IBM which became obsolete while it was still in litigation. Congress thought it had caught up with this change, and dealt with it generically, when it passed the up-dated Copyright Act of 1976--a "law to end laws," as one official has put it. Yet a few short years later it finds itself confronting bills to deal with semiconductor chips, home taping, and satellite viewing, all new challenges and all technologically based.[120]

One of the things Congress did in the 1970's was to establish a National Commission on New Technological Uses of Copyrighted Works. Why CONTU did not anticipate and treat all these challenges is a matter of some interest. Despite the generality of its title, the Commission was set up to deal only with computer and photocopying issues. It considered the home-taping (Betamax) issue but decided not to take it on. The reasons given for this abstention were less persuasive probably than the limitations placed on CONTU by its creator. CONTU was a way to keep new-technology controversies from blocking passage of the 1976 Act; it was "a classic cop-out on the part of Congress," not a positive effort to get on top of the new technologies.[121]

That leaves unanswered the question to be taken up in this report: How *should* Congress approach the dynamics of technological change? At the Congressional symposium earlier this year, some interesting suggestions were made. The copyrightability of new works, it was proposed, should be decided in each instance with attention to the balance of incentives between creator and consumer. Specifically, it was suggested that the following questions should be applied to each new work:

(1) Is there justification for protection, in terms of investment and other factors?

(2) Should the protection take the form of legal or self-help measures?

(3) If legal, what form?
    (a) Copyright
    (b) Other intellectual property
    (c) *Sui generis*

The determination was to be made *each time*, for each new work in its particular setting. That was key to the recommendation, and there were various supporting considerations.[122]

First, each determination of copyright eligibility may have its own special effects on public-policy matters of importance to the nation: information flows, balance of payments, treaty obligations. Second, some of the more volatile technologies may call for shorter terms of protection than others. Third, and stressed most often by the commentators, the timing of the protection decision can be important: If made too soon, before an innovation is understood or has established its place in the economy, natural developments could be prematurely foreclosed. Congress should wait, Benjamin Compaine of Harvard's Information Resources Program has testified, and make sure it is responding to real problems.[123]

But there is another side to this coin. Chairman Kastenmeier remarked at the same hearing that "it is not enough to react to past events." The politics of *post hoc* special-interest mediation must certainly be familiar to the Congress: They are what delayed the 1976 Copyright Act revision for more than

20 years, and forced the resort to CONTU. Legislation that is backward-looking and reactive too often loses sight of the principles on which the present and future viability of the law must depend. It can be impractical also, if it should try to treat separately new and more traditional works that are packaged and marketed together. Then too, legislation that waits for reality to unfold risks distorting one important aspect of that reality: the need for pre-investment certainty about the state of the law.[124]

There is a case to be made, accordingly, for generic rather than particularistic law-making. What some suggest is needed is the identification of major underlying trends and implications --such as is attempted in this paper--as a basis for forging new and durable rules or procedures. That is what Congress seems to have had in mind in 1976, and the suggestion made here is that the effort not be too lightly abandoned. In addition to the factors just cited, there is the added importance of enlisting or maintaining public confidence and support. There seems less chance of doing that with a particularistic law that comes to look like a tax code, than there would be by sticking with a generic law that looks more like a human rights declaration.[125]

But what of the generic approach? Does it conform with past traditions and present necessities? The answer appears to be yes. The Berne and UCC Conventions contain generic definitions of copyrightable works, not tied to any particular technologies. The UCC's "adequate and effective" standard is likewise open and flexible. As for this country's 1976 law, it started off in a more generic direction than it actually wound up taking. Back in 1961, the Register of Copyrights recommended statutory language "to cover everything now considered copyrightable, including future works presented in newly developed forms or media." Congress in 1976 seemed to accept that proposal, in its Section 102 coverage of "any tangible medium of expression now known or later developed." If there had been no accompanying report, that might have settled things. But there was, and it didn't.[126]

The House Report on the Copyright Act, which is considered authoritative, said that in Section 102:

> "....the committee's purpose is to avoid exhausting the Constitutional power of Congress...[Otherwise], the courts would be faced with the alternative of holding copyrightable something that Congress clearly did not intend to protect, or of holding constitutionally incapable of copyright something that Congress might one day want to protect.... Section 102 implies neither that that [copyrightable] subject matter is unlimited nor that new forms of expression within that general area of subject matter would necessarily be unprotected."

This wins the GG award, for "grudgingly generic." Its Constitutional reading seems out of focus and unnecessary. The Betamax result, of a remand of cases to Congress, was all but invited--even if that particular decision had not been compelled, as we shall later see it was, by other factors.[127]

So Congress aimed for generic treatment in 1976, and missed. Should it try again? The present Register of Copyrights thinks so. He proposes that works and rights and uses should be stated generically, subject to later Congressional subtraction if experience with a given technology proves that advisable. That would be one way of dealing with the variables. We will examine another.[128]

The beginning of wisdom, perhaps, is to separate technology impacts on "works" from those on "uses". CONTU, again despite its name, dealt with both: "works created by the application of and used in conjunction with computers and reprographic systems." But surely the first is more straightforward than the second. A "work" in copyright parlance can be described as anything that is not a copy, and that commends itself for protection to the civilized usage of modern nations. It does not need to boast specific literary, artistic, or scientific qualities; indeed these terms in the UCC Convention have been called surplusage, and the American simplicity seems preferable: "original works." To be sure, there is need to mark a dividing line from the utilitarian inventions appropriate to patent or to sui generis protection; but the process for doing that, as with computer software, is going forward without let or hindrance from the 1976 Act. Technology and "works" have not proved incompatible.[129]

The real problem is with "uses". The Betamax case was a "use" case; there was no doubt of the copyrightability of the television programs that were copied on VCR's. Like the VCR's, many new uses are decentralized and undetectable: photocopying, videotaping, cable tapping, private earth stations. They operate in the world of what has been termed "private publishing." But their operation seems not very different, in principle, from the decentralized play of juke box music that bedeviled the music industry until ASCAP was formed. Other blanket and compulsory license mechanisms have been created since then, and further such remedies--for example, a levy on reproduction equipment--are being proposed.[130]

It is on this question of remedies that Congress might wish to focus attention. When the Betamax case was "sent back", it was not just because of the VCR technology but mainly because, in the Court's view, the kind of use made of the broadcasts--time shifting--was not an infringement. That is an appropriate and familiar judgment for a court to make. A similar one would be that a conventional remedy is unavailing, that special arrangements like a levy or a blanket license would be needed if a right were to be vindicated.

The oldest legal saw of all may be the one that says there can be "no right without a remedy." In practical terms this means that, if a court finds no practicable remedy in any given case, then there is no effective legal right. One way a generic statute could work, conformably, is for the courts to continue to "return" unremediable complaints to Congress, which could then decide: (a) to do nothing, thereby allowing certain rights to enter the public domain; or (b) fashion some administered remedy appropriate to the technology. This process, traditional in origin yet contemporary in application, just might meet the need.

In the next Part we shall consider in detail how the various organs of government would relate to such a scheme.

V. U.S. POLICY IMPLICATIONS

A. Legal

A recent book review by Naomi Bliven in The New Yorker endorsed the "notion that, just as physics has made matter less substantial, property has become more abstract, with concepts like the velocity of Eurodollars replacing the chink of gold." Congress has heard testimony from futurists and analysts alike that intellectual property concepts like copyright are now outmoded or increasingly unenforceable. These points require some attention.[131]

Harlan Cleveland has likened copyright to the fabled efforts of King Canute to arrest the tide. Information, he says, is "expandable", "diffusive", and "shareable", hence not readily subject to control. What controls are possible are extra-legal in character--built into the software, perhaps, or supplied by the short intervals between research and development cycles. The rewards for creation, he suggests, can come from institutions like universities or governments.[132]

Cleveland also plays around with the seeming contradiction between policies of "free flow" and policies of copyright control, but the foregoing are his main points. He finds support for the institutionalization of rewards from an American futurist and an Indian scholar, and fortification of his basic argument from two MIT analysts, Ithiel de Sola Pool and Anthony Solomon. These two agree about the uncontrollability of information flows, stressing the high-speed and dispersed nature of the transactions made possible by computer communications in particular. The thrust of their study is that copyright as we know it will have to be abandoned.[133]

There are reasons to question the force of these analyses. First, information has been known for a long time to exhibit what economists call "public goods" characteristics; it is not a new discovery; indeed, it has traditionally served as part of the justification for intellectual property protection rather than as a basis for its denial. (Copyright was not needed until the printing press made information "expandable", "diffusive", and "shareable.")[134]

Second, the high speed and high volume of today's decentralized electronic processing does not change the nature or the relationships in an information transaction, although it may take a kind of "super-slo-mo" (to borrow from ABC's Olympics coverage) to unravel it. There is still going to be a skein of creator-packager-distributor-user relationships, perhaps instantaneous, perhaps geographically and numerically widespread. That could argue for using technology to track technology, or it may argue for some kind of surrogate compensation mechanism; but, conceptually, it need not argue for the death of copyright.[135]

Third, Cleveland's "free flow" play on words is not persuasive. In fact both "free flow" and copyright are endorsed side-by-side, without contradiction, in the Universal Declaration of

Human Rights. (To make the point clear, U.S. position papers in the UNESCO debates of the late 1970's took to calling for "the unregulated flow of information.")[136]

Harlan Cleveland's other idea, of institutionalizing information rewards, is somewhat reminiscent of the Soviet patent system, which gives the inventor a certificate and a lump-sum payment while reserving title for the state. In copyright, to limit incentives to that kind of system would run counter to the fundamental postulates of democratic diversity implicit in the First Amendment. It would appear unwise, at the least, for American policy to rely for creative incentives exclusively on the prestige associated with Bell Labs or IBM or the University of California, or the National Science Foundation or the National Endowment for the Humanities. This country has benefited enormously in the past, and should wish to in the future, from untethered imaginations that care nothing about contemporary fashions or conventional wisdom; from the basement inventor and the attic poet; from the individual.*[137]

There are practical questions to be asked, and the copyright skeptics to their credit ask a good number of them: How is accountability to be maintained, what is to be the measure of use, what compensation mechanisms are to be employed? Two matters we have previously mentioned bear repeating at this point. "Casual" use or copying can probaby be written off as not economically significant. And, we may need a new remedial matrix along the lines suggested at the close of Part IV.

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* The geosynchronous satellite was developed by an individual who offered to resign from Hughes, and pursue his invention alone, when told that Bell Labs' orbital satellite was the only way to go.

The other "legal" issue is whether and to what extent we can forego copyright enforcement in favor of self-help remedies. Senator Mathias has frequently raised this question, and Congressman Kastenmeier has pointed out that the "chips" industry managed to reach its present flourishing vitality without any legal protection for its designs. [138]

There are two types of self-help to be considered--technical and economic. The technical fixes seem not very promising. Either they don't work, like non-copiable paper; or they are uneconomical, like encryption; and/or they are too easily overcomable by counter-technology. If they survive those defects they still run counter to the competitive necessity to provide "user-friendly" technology.[139]

On the economic front, 19th Century American publishers tried to make do without copyright by entering into a "gentleman's agreement" not to trespass on each other's publications of specified foreign authors. It fell apart when more publishers entered the market, and since 1890 such behavior has been outlawed by the Sherman Act.[140]

A unilateral possibility that attracts much attention today is the charging of a higher price for the first sale of a work, as compensation for the uncontrolled copying it is anticipated will later take place. In the software field, a high first price followed by much lower prices for periodic supplements has been recommended as a means of taking away the incentive to copy. Again, the ability to impose such a scheme depends upon market power, which may or may not be present. Also, those who are studying this possibility are not sure what classes of transactions it may fit. One slant is to charge high prices to centralized institutions, not individuals; but this would not fit the facts in broadcasting or pay cable where the individual copiers are unrelated to the central organization.[141]

Another possibility is to offer "amnesty" to unlicensed users--freedom from suit or prosecution if they buy the product or service. The cable industry has experienced some dramatic successes with this technique.[142]

Again in the software field, "object code" is hard to copy and requires reliance on the vendor for its maintenance. Limiting a sale to object code, accordingly, and binding up the transaction with a web of secrecy agreements, can be a way of securing substantial protection.[143]

But only, again, if the market permits. If a competitor is willing to sell source code, or dispense with the restrictive agreements, this approach quite literally will not sell.

A "strong" invention or work may generate and sustain its own market power, at least for a time. Rapidly changing innovation (R&D) cycles may bridge those time intervals, and so extend the protection. We do not know; an investor may not be able to foretell with confidence; public policy should not, it seems, predicate an abandonment of intellectual property on self-help as we now see it--not least because all the techniques now in use have intellectual property to fall back on.

The National Science Foundation is pursuing studies in this field whose eventual findings may contribute importantly to the continuing review of copyright we will be recommending in Part V C.[144]

B. Social

Copyright as we have said is a creature of market eocnomics. It operates in a market--information goods and services--that is at the heart of what America is becoming in the late 20th Century: an Information Society. That development inevitably attracts to itself all the swirling arguments about fairness and opportunity that characterize the current state of this country's social debate. Who gets to send a message and who gets to receive it and who decides? The author of this paper has recently completed a lengthy treatment of this subject (to be published in the winter issue of the Federal Communications Law Journal), called "Getting the Message." Its only relevance here is as a reminder that those issues are complex and controversial and need not have anything to do with copyright at all.

Is there a case to be made for additional creative subsidies, or minority participation in distribution enterprises, or education and training in the use of information technologies, or welfare payments to cover cable or computer subscriptions, or anything in the Information Society that the market will not supply? Those are important questions; they can and should be addressed without reference to copyright, which is a market device that can operate in markets of any size or shape, public or private or mixed. Acceptance of that fact should help to keep our intellectual property policies from getting any more complex than they have to be.[145]

C. Institutional

In House hearings on copyright and technological change held last year, Chairman Kastenmeier kept asking the witnesses: What role should the various governmental entities play? Business sees that as an important question too, specifically as regards the development and execution of policies for international copyright.[146]

In this section we will look at the different entities and propose a specific working model for: (1) the structuring of the Executive branch; (2) relations between the three branches; (3) a statutory scheme for keeping pace with innovation; (4) a strengthened public-private advisory process; and (5) the relationship of domestic to treaty law.

Congress has certain strengths and also limitations. It seems more likely than the other branches to resist the lures of specialization, and to keep in mind the stake of the general public in principled lawmaking. The two lead committees in the House and Senate have plenary jurisdiction over all federal aspects of intellectual property--patents, copyrights, trade marks, and unfair competition--and so can consider the statutory treatment of information transactions as a whole. On the other hand those committees by themselves may lack the authority and experience to promote a forward-looking international copyright policy, such as by authorizing the funding of Third World copyright training programs.[147]

That may suggest the convening of occasional joint hearings with other committees--an idea that seems worth pursuing. In their own domain, the copyright committees perhaps need to gain a strengthened sense of their own conviction, letting go of the grudgingness for example that detracts from the generic quality of the Copyright Act. They also need assured resort to some independent facility for systematic outside advice. The Congressional Research Service has not been asked to develop such a competence, because the Copyright Office has traditionally been available as an arm of Congress. But today for whatever reason, the Copyright Office seems no longer to be regarded as a distinctly Congressional resource. The location of this office will bear some further consideration.[148]

The courts should be instruments, in most people's view, of Congressional policy determination. That means the judiciary should allow time, if necessary, for Congress to develop a consensus on standards and procedures. The courts should not undertake to create new rights and remedies, or to balance competing interests on a case-by-case basis, or otherwise to take over the law-creating function from Congress.[149]

The Betamax decision can be seen as a confirmation of these views. The Supreme Court majority declined to create a new right or, for that matter, a new remedy. Instead, when it found no infringement it in effect returned the proceedings to Congress for whatever further deliberations might seem legislatively appropriate. The courts can properly serve this "tripwire" function of identifying classes of cases that may warrant further lawmaking consideration.

Proposals are occasionally heard to create a specialized Copyright Court, or more pointedly to vest in the newly created Court of Appeals for the Federal Circuit (CAFC) exclusive jurisdiction over compulsory copyright license appeals. That court already sits on similar patent appeals, and the case for specialized determination might seem somewhat the same.[151]

In fact, however, it is not. Copyright judgments do not require highly specialized engineering sophistication, and if they were pushed in that direction they could lose their all-important grounding in general social values. The regular federal courts have in fact performed well with technical cases like the Apple and Betamax litigations. Very few of the copyright cases come out of CRT-type proceedings, and indeed very few copyright controversies.ever get to any kind of litigation. The case for a general jurisprudence therefore seems persuasive (besides which, we are told that the New York and Los Angeles copyright bars would strenuously resist any shift of jurisdiction!)[152]

The Executive branch has organized itself to deal systematically with intellectual property, in a Working Group chaired by the Commissioner of Patents under the auspices of a Cabinet Council for Commerce and Trade. The other members of this Working Group are, currently, the President's Science Adviser, the Assistant Attorney General for Antitrust, and senior representatives from the Office of Management and Budget, the Council of Economic Advisers, the Office of Special Trade Representative, and the Departments of State and Commerce. The Group has dealt collegially with protection of chip designs, the treatment of software, the Betamax issue, and international questions. According to most accounts the coordination process has worked well and there are no hidden "turf fights".[153]

The Copyright Office is not a member of this group, however, not even ex officio. The official reason is that it is a member of the legislative branch; but regulatory agencies like the FCC find it possible to take part ex officio in Executive deliberations, so that this rationale does not seem very persuasive. If it were the real reason, it might furnish an argument in favor of shifting the Copyright Office into the Executive branch. That is a fairly serious undertaking, however, and should be addressed in a more rounded fashion.

The Copyright Office was placed where it is because the

Library of Congress is the national depository of copyrighted works. A number of people now see this co-location as a historical anomaly that should be re-visited. They may not take adequately into account, perhaps, the spaciousness of view encountered in the Copyright Office. No other agency, in Congress or the Executive, in public or private sectors, seems as much at home with the larger issues of copyright as this office is. If a shift to the Executive branch were to deflate that balloon, another one might have to be filled up for Congress' benefit in the CRS or elsewhere.

There is another side to this coin, however, which is political accountability. The issues and strategies of the Information Age are inescapably political in character, entailing as they do the fundamental values and future prospects of a free society. Much as one may value the Serene Life, and hope to attain it, the information choices of our time are too dynamic to fall to the province of a Platonic high priesthood. They are and must be a staple of the democratic process, and accountability through the President to the people is a necessary and traditional part of that process.

If that is deemed persuasive, a transfer could be effected by changing the name of the Patent and Trademark Office to the Intellectual Property Office, and creating an Assistant Commissioner for Copyrights. It has been pointed out that this would still subject that official's viewpoints to more checks and balances--from Justice, OMB, STR, and others--than now operate on the Register of Copyrights; so that any concern that may exist about private-interest cooptation should be diminished, not enlarged, by the move.[154]

There is the further question of who should take the lead and how, in international copyright and related matters. At Commerce, the NTIA has relevant experience but it has been following matters only tangentially and its international staff and capability have been severely diminished. STR is an activist agency, experienced, and with plenty of support in the business community. It tends to see everything, however, as an issue of "market access"; whereas the actual political dimensions are much broader than that. State seems the logical department to head things up. Notably, it has not joined STR and Commerce in leading the unilateralist charge of recent years. Perhaps it knows better. But State's capacity too has been severely diminished by past and prospective staff curtailments, and by disintegration of focus among rival bureaus.[155]

The answer here may be the same as has been suggested (in some detail, by the present author) for information diplomacy generally. In brief: Create and staff an Assistant Secretary of State for International Communications and Information Policy, with interagency lead authority; establish, as one of the appendant offices, a Director for Intellectual Property; set up Departmental training and career paths for information diplomacy; and fill 50 percent of the resulting staff requirements initially from the private sector, for the first two to three years.[156]

Constituency-broadening may be a necessary adjunct to the creation of such a structure, and to the building of comprehensive and long-range policy perspectives. It could also overcome the possibly disproportionate influence of the "squeaky wheels" among enforcement activists, by bringing in a wider array of industry groups. These are not fully a part of the policy community now. To illustrate, Chronicles of International Communication, a knowledgeable information-policy report, does not now cover international copyright. Nor does Intermedia, the organ of the International Institutes of Communications. Substantial industry groups, like CBEMA and the U.S. Council on International Business, have also yet to become systematically engaged.

We have suggested elsewhere a high-level private-sector mechanism for general improvement of the policy environment, in the form of a free-standing and privately financed Council on International Communications and Information. That would be in the interest of international copyright as well. But to strengthen and modernize intellectual property treatment in particular, there is also need for a focused advisory group. We shall consider that, in context, next.[157]

A model system, then, marshalling all these elements of governance to deal with intellectual property, and more particularly with the challenge of keeping pace with new technology, would look like this:

First, it would make and keep a distinction between new works on the one side and new uses/new remedies on the other.

Second, it would affirm Congress' intention to legislate generically. The opyright Act itself could be left untouched. All that might be needed is a rewrite of the 1976 committee reports on this point, perhaps in support of a Joint Resolution saying in effect "we meant it." The exact technique would have to be considered.

Third, in these documents Congress would declare a presumption against future legislative extension of the Copyright Act to *new works* duly found to be outside the ambit of its generic coverage. Congress would, however, remain prepared to consider *sui generis* protection for such works on an *ad hoc* basis.

Fourth, a small high-quality public advisory group would be created with balanced participation from the public and private sectors and with a substantial quotient of practical experience. This group, whose meetings would be open to the public, should be endowed with sufficient staff and resources to be able to monitor *new uses* and *available remedies* in a continuing manner, and to make periodic reports and recommendations to Congress. (Some special legislative authorization and appropriation might be needed for this purpose.) The group would consider new technological and economic developments, impacts of various options on all affected parties including end consumers, and effects of those options on information exchange. It would keep abreast of court decisions and international transactions.

Fifth, if and when *established remedies* are found inadequate to deal with *new uses*, the advisory group and the Congress would have the option (a) to leave the parties where they lie or (b) to create a new remedy such as blanket or compulsory licensing, or a levy on reproduction equipment. In addressing choice (a), they would examine the availability both of self-help remedies and of private remedies under other state or federal laws. In approaching choice (b), they would entertain a presumption in favor of the least possible government intrusion, i.e., against governmental tribunals or rate-setting.

Sixth, this whole system would be scheduled for comprehensive review at the end of ten years.[158]

It remains to consider how such a "generic" approach might square or interact with the international treaty framework. From all available indications, treaties would not present a barrier.

The UCC itself takes a "generic" approach to protection. It calls for "the adequate and effective protection of the rights of authors and other copyright proprietors in literary, scientific and artistic works," without limitation. The "rights" in question are those defined by the practice of civilized nations. Also, as we have seen, the "adequate and effective" clause is something of an automatic or flexible modernization device.[159]

The Berne Convention's Article II extends likewise to "every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression." This is described in an official WIPO publication as "all-embracing protection," covering "all works capable of being protected." There are particular examples, but these are "not limitative...

The Convention allows member countries to go further and treat other productions in the literary, scientific and artistic domain as protected works."[160]

There may still be differences, of course, as to whether a production is "literary" or utilitarian; but this is not something to be decided centrally. At the margin of coverage, states and secretariats are free to disagree. Thus, although Arpad Bogsch himself believes that computer software should be treated in a new convention outside the boundaries of copyright, a WIPO meeting of governmental experts in June of 1983 took the view that Berne and the UCC already apply. This means in practice that the issue of software copyrightability will be resolved not by centralized dictate but by the pull and tug of reasoned positions among interested states (like the U.S. and Japan).[161]

That is an important safeguard. Treaties are needed and valuable to contain the strenuous impulses of Information Sovereignty. Berne and the UCC might be hard put to survive a reopening, if this allowed the whole unsatisfied agenda of Third World revisionism to march in the door. Fortunately, no reopening seems needed to keep the conventions abreast of technological innovation.[162]

Finally, there is the question of U.S. adherence to the Berne Convention. This may be desirable and is certainly favored by the WIPO Secretariat--as "a fitting way to celebrate the Berne Centennial in 1986"--but it should be considered on its own merits and not as a response to the new-technology challenge.

For that, so far as appears, the UCC will do as well. The issue of Berne membership is one on which the existing organs of government--particularly the Department of State and the Copyright Office--should be looked to for recommendation.[163]

D. Political

International copyright responds to a set of forces. Those forces operate more broadly than on copyright alone. The appropriation of value, if that is what a foreign country wants, can be accomplished by many non-copyright devices: taxes, duties, tariffs, exchange rates. The refusal of market entry, if that is what is sought, can be similarly effected through quotas or content requirements or restrictions on doing business. The resort to such techniques, which could take the matter out of the Congressional copyright committees' jurisdiction, should not take it out of their field of interest.[164]

Copyright encourages information to flow, and information movements across national boundaries stir the anxieties and rivalries of "information sovereignty." One of these anxieties, perhaps the deepest one, is cultural in nature: ill a given country's traditions and its sense of self be swamped? Like copyright itself, the answer to such questions should be balanced in nature--encouraging both free flow and cultural diversity. That is in fact the American domestic commitment, and the copyright community--in Congress and out--knows this perhaps better than most.

International information politics is a game that many can play and usually do. It is not a unidimensional pastime, whether of trade or social issues or culture or anything else. It engages technical expertise but cannot be limited by it. For us in this country, it presents the question, what kind of use do we want to make of our chief comparative advantage in the world? What kind of world do we hope to build? What is the essence of sustainable reciprocal self-interest for the 21st Century?

For that enterprise, it would seem, no small minds need apply.

Footnotes

1. Ringer, *The Role of the United States in Informational Copyright-- Past, Present, and Future*, 56 Geo. L. J. 1050 (1968

2. *Sony Corp. of America* v. *Universal City Studios, Inc.*, _____ U.S. _____, 52 U.S.L. Week 4090, 4092 (1984).

3. See, *e.g.*, Mr. Justice Jackson, The Struggle for Judicial Supremacy (1941). An unsolicited submission recognizing this argument but advocating its disregard was made to the cognizant House Subcommittee in 1983. Hearings on Copyright and Technological Change, before the House Judiciary Subcommittee on Courts, Civil Liberties, and the Administration of Justice 251 (98th Cong., 2d Sess., 1983) (uncorrected galleys) (hereinafter cited as *Hearings on Copyright and Technological Change*.) No Constitutional authorities or reasoning were supplied in aid of the position taken, which seems to have been based primarily on policy preference.

4. *Id*., p. 1 (opening statement of Chairman Kastenmeier). See Note, *Copyright Infringement and the First Amendment*, 79 Colum. L. Rev. 320, 321 & nn. 7, 8 (1979)..

5. *E.g.*, Carolyn Kalett, "International Character Licensing," U.S. Copyright Office Symposium on the Sources of International Copyright Law, June 1984 (hereinafter cited as *International Copyright Symposium*).

6. Hoffman, The Software Legal Book, Part II, p. A-2 (1984 ed.); interview with Joseph Genovese, Senior Patent Counsel, Control Data Corporation.

7. Hoffman, *supra* note 6, part II, p. B-3; interview with Joseph Genovese, *supra* note 6. The idea-expression dichotomy is woven into the 1976 Copyright Act, see H.R. Rept. No. 94-1476 (1976), pp. 56-57; Levine, "Subject Matter of Copyright," in *Symposium on the New Copyright Law*, 25 Bull. Copr. Soc'y 191, 202-03 (1978).

8. Hoffman, *supra* note 6, parts II, IV, appendices A-C, E-H; Baumgarten, Copyright and Computer Software, Data Bases & Chip Technology 25-26 (1984); Baumgarten, *International Copyright Symposium* .

9. Final Report of the National Commission on New Technological Uses of Copyrighted Works 19 (1978) (hereinafter cited as *CONTU Report*).

10. World Intellectual Property Organization [WIPO], Guide to the Berne Convention, para. 2.8 (1978); Baumgarten, Primer of The Principles of International Copyright 3 (1984)); Flacks, U.S. Copyright Office, *Draft Report for Senator Leahy* 48-52 (1984); Gyorgy Boytha, *International Copyright Symposium* (Rome Convention on "Neighboring Rights").

11. *Sony Corp. of America* v. *Universal City ______, Inc.*, _____ U.S. _____, 52 U.S.L. Week 4090, 4093 & n.11 (1984); Ringer, *The Unfinished Business of Copyright Revision*, 24 UCLA L. Rev. 951, 960-61 (1977). See Part IV E, *infra*.

12. Baumgarten, *supra* note 10, p. 5; Flacks, *Draft Report for Senator Leahy*, *supra* note 10, pp. 9-10; Dorothy Schrader, General Counsel, U.S. Copyright Office, and Alice Zalik, Office of Special Trade Representative, *International Copyright Symposium*. See Parts II C and V E, *infra*.

13. See Baumgarten, *supra* note 7, p. 26. Article 9 of the Berne Convention for the Protection of Literary and Artistic Works, as revised at Paris in 1971, grants to authors "the exclusive right of authorizing the reproduction of these works, in any form."

14. Copyright and Design Law: Report of the Committee To Consider the Law on Copyright and Designs 691-725 (UK, 1977) (hereinafter cited as *Whitford Committee Report*): Libott, "Infringement and Remedies Under the Copyright Act of 1976," in *Symposium on the New Copyright Law*, 25 Bull. Copr. Soc'y 191, 237 (1978); interview with Joseph Genovese, *supra* note 6.

15. Interview with Lewis Flacks, U.S. Copyright Office; Schrader, *International Copyright Symposium*.

16. *Whitford Committee Report*, paras. 51-57.

17. *Ibid*. 7 Whiteman, Digest of International Law 905-06 (1970); DaSilva, *Droit Moral and the Amoral Copyright*, 28 Bull. Copr. Soc'y 1, 6, 47 (1980)

18. Schrader, *International Copyright Symposium*. See Part IIA, *infra*.

19. Ladd, *To Cope With the World Upheaval in Copyright*, Copyright, October 1983, pp. 289, 293. See DaSilva, *supra* note 17, p. 57.

20. See generally Homet, *Getting the Message: Statutory Approaches to Electronic Information Delivery and the Duty of Carriage* (forthcoming in the Federal Communications Law Journal).

21. Interview with Brenda Fox, General Counsel of the National Cable Television Association.

22. Stewart, *International Copyright in the 1980's*, Bull. Copr. Soc'y 351, 375 (1981); interview with Lewis Flacks, *supra* note 15; interviews with Truman Eustis, Senior Copyright Counsel, *New York Times*, and John Eger, Vice President, CBS Broadcast International.

23. Statutory levies on recording equipment have been proposed in this country in the wake of the *Betamax* decision, and were favored in the UK by the *Whitford Committee Report*, pp. 322-23.

24. Ladd, *supra* note 19, p. 295.

25. *Hearings on Copyright and Technological Change*, p. 70; Memorandum from Chairman Kastenmeier to members of the Judiciary Subcommittee on Courts, Civil Liberties and the Administration of Justice, "Copyright Royalty Tribunal/Cable Television Reform," June 13, 1984 (H.R. 5878).

26. Bernard Korman, General Counsel of ASCAP, *International Copyright Symposium*; interview with Jon Baumgarten, Esq., and Eric Smith, Esq., partners in Paskus, Gordon & Hyman; interview with Lewis Flacks, *supra* note 15.

27. Bernard Korman, *supra* note 26; Norman Alterman, Vice President of MPEAA, *International Copyright Symposium*; David Leibowitz, U.S. Copyright Office, *ibid*.

28 . Ladd, *supra* note 19, pp. 295-96; Recent Development, *Blanket Licensing of Music Performing Rights: Possible Solution to the Copyright-Antitrust Conflict*, 37 Vand. L. Rev. 183 (1984); Proceedings of Congressional Copyright and Technology Symposium: Summary of Rapporteur 9-10 (1984) (hereinafter cited as *Congressional Copyright and Technology Symposium*). See Part IV B, *infra*.

29. Baumgarten, *supra* note 10, p. 2. See generally Schrader, "Historical Overview of the International Aspects of American Copyright," paper prepared for the *International Copyright Symposium*.

30. Berne Convention for the Protection of Literary and Artistic Works, 1886, with subsequent revisions at Berlin (1908), Berne (1914), Rome (1928), Brussels (1948), Stockholm (1967), and Paris (1971). (Not all texts have been subscribed to by all member states.) The *International Copyright Symposium* benefited from several days of presentation by Gyorgy Boytha, Head, Copyright Law Division of WIPO.

31. Buenos Aires Convention on Literary and Artistic Property, 1910; Schrader, *International Copyright Symposium*.

32. Ibid; Universal Copyright Convention, done at Geneva, 1952, with revisions and protocols done at Paris, 1971; Bogsch, The Law of Copyright Under the Universal Copyright Convention 5-6 (3d ed. 1968).

33. Schrader and Boytha, International Copyright Symposium.

34. Glacks, Draft Report for Senator Leahy, supra note 10, pp. 22-23, 26; Schrader, International Copyright Symposium.

35. Ibid.

36. Rome Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations, 1961; Geneva Convention for the Protection of Producers of Phonograms Against Unauthorized Duplication of their Phonograms, 1971; Boytha, International Copyright Symposium.

37. Brussels Convention Relating to the Distribution of Programme Carrying Signals Transmitted by Satellite, 1974; Hearings on S. 736 before the Senate Judiciary Subcommittee on Patents, Copyrights, and Trademarks, 98th Cong., 1st Sess. 12 (1983) (hereinafter cited as Senate Hearings); interviews with Kenneth Robinson, NTIA and John Eger, CBS. See Part II B, infra.

38. International Telecommunications Convention, Malaga-Torremolinos 1973, Art. 22; ITU Radio Regulations, Geneva 1959, Art. 17; Act of June 19, 1934, ch. 652, Section 605, as amended, 47 U.S.C. Section 605 (1980); Leibowitz, International Copyright Symposium. The ITU Convention is not self-executing. Ibid.

39 . Alice Zalick, Office of Special Trade Representative, International Copyright Symposium. See Part II C, infra.

40. Paris Convention for the Protection of Industrial Property, 1883, with subsequent revisions at Brussels (1900), The Hague (1925), London (1934), Lisbon (1958), and Stockholm (1967); Michael Kirk, U.S. Patent and Trademark Office, International Copyright Symposium.

41. Baumgarten, supra note 7; Baumgarten, International Copyright Symposium; Hoffman, supra note 6, Part I, B-1; Genovese, Data Corporation, May 31, 1984; interview with Vico Henriques, President, CBEMA.

42. Baumgarten, International Copyright Symposium; interview with Lewis Flacks, supra note 15. See also Part III B, infra.

43. H.R. 5525, 98th Cong., 2d Sess. (1984); interview with John Podesta, assistant to Sen. Leahy; Baumgarten, International Copyright Symposium.

44. Ibid.

45. Ladd, supra note 19; interview with Lewis Flacks, supra note 15.

46. Senate Hearings 40; Norman Alterman, General Counsel of MPEAA, International Copyright Symposium.

47. IFPI, "Piracy" issue of Media Law, October 1983; AAP Copyright Protection Committee, "Piracy in Taiwan and Singapore" (1984); Genovese, supra note 41, pp. 13-16.

48. Sony Corp. of America v. Universal City Studios, Inc., _____ U.S. _____, 52 U.S.L. Week 4090, 4098 (1984); Flacks, Draft Report for Senator Leahy, supra note 10, p. 4; SATVISION, April 1984, p. 18.

49. See Senate Hearings.

50. Interview with Vico Henriques, supra note 41.

51. Bogsch, supra note 32, pp. 5-6; Kirk, International Copyright Symposium.

52. Interview with Lewis Flacks, supra note 15.

53. See Homet, Law-Making for International Information Flows, 4 N.Y.L.S.J. Int'l & Comp. Law 65 (1982), esp. Appendix: Transborder Data Flows and the Claims of Offended Sovereignty, pp. 72-76; Homet, Reshaping the U.S. Government for the Information Age, in Sterling (ed.), International Telecommunications and Information Policy 72 (1984); Homet, U.S. Policy and International Information Flows: Some Keys to an Integrating Perspective, Chronicles of International Communication (composite issue, 1983), reproduced in Sterling, supra, pp. 82-97.

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55. Webster, Direct Broadcast Satellites: Proximity, Sovereignty and National Identity, Foreign Affairs, Summer 1984, p. 1161; Alterman, International Copyright Symposium. See Part III B, infra.

56. Schrader and Kirk, International Copyright Symposium.

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61. AAP Copyright Protection Committee, supra note 47; interview with Vico Henriques, supra note 41.

62. Caribbean Basin Economic Recovery Act, P.L. 98-67 (August 5, 1983); S. Rept. 98-485 (1984) (GSP); Eric Smith, presentation and documentary materials, International Copyright Symposium; Leibowitz, ibid; interviews with Jon Baumgarten & Eric Smith, supra note 43. Compare S. 2549, 98th Cong., 1st Sess. (1984) (Senator Lautenberg's version of a GSP bill).

63. AAP Copyright Protection Committee, supra note 47.

64 . P.L. 98-67, section 212(c)(a) (1983); Eric Smith, presentation and documentary materials, International Copyright Symposium.

65. Ibid.

66. Ibid. P.L.98-67, section 212(b)(5) (1983).

67. See AAP Copyright Protection Committee, supra note 47.

68. Zalick, International Copyright Symposium.

69. Schrader, International Copyright Symposium.

70. Schrader and Boytha, International Copyright Symposium.

71. Ringer, supra note 1, p. 1078.

72. Flacks, Draft Report for Senator Leahy, supra note 10, p. 5; Winter, International Copyright Symposium.

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74. See Part V C, infra.

75. Flacks and Boytha, International Copyright Seminar. The author of this report represented the United States in UNESCO "New Order" debates and negotiations from 1978-1980.

76. Interview with Michael Keplinger, supra note 58; interview with Hugh Donaghue, Vice President of Control Data Corporation and chairman, State Department Advisory Working Group on Transborder Data Flows.

77. Schrader, International Copyright Seminar. See also Parts IV E and V B, infra.

78. Interview with Michael Keplinger, supra note 58.

79. Interview with Alice Zalick, Office of Special Trade Representative.

80. Newcity, Copyright Law in the Soviet Union 32-33, 36-38, (1978).

81. Id. at 41; interview with Lewis Flacks, supra note 15.

82. Stewart, International Copyright in the 1980's, 28 Bull. Coprt. Soc'y 351, 352-53 (1981).

83. Leibowitz, International Copyright Seminar. See the discussion of the 1971 revisions at the close of this Part III B.

84. Baumgarten, ibid.

85. Ibid. In a noteworthy display of comity, the French court in this Apple computer litigation applied American law to the contractual aspects of the case, using customary French conflic-of laws rules.

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88. Baumgarten, International Copyright Symposium.

89. Genovese, supra note 41; Baumgarten, International Copyright Symposium

90. Ibid.

91. Interview with Hugh Donaghue, supra note 76; Tennyson, "Locksley Hall."

92. Baumgarten, and Kirk, International Copyright Symposium.

93. See Part II C, supra.

94. Baumgarten, International Copyright Symposium; interview with Hugh Donaghue, supra note 76.

95. Interview with Lewis Flacks, supra note 15. See also U.S. Copyright Office, Circular R38a (1983).

96. Schrader and Flacks, International Copyright Symposium.

97. Ibid.

98. Flacks, Draft Report for Senator Leahy, supra note 10, pp. 37-38; Tocups, The Development of Special Provisions in International Copyright Law for the Benefit of Developing Countries, 29 J. Coprt. Soc'y 402 (1982); Tunis Model Law on Copyright for Developing Countries, and Commentary, 10 UNESCO Cprt. Bull. 10 (1976).

99. Kirk, International Copyright Symposium; interviews with Vico Henriques, supra note 41, and Joseph Genovese, supra note 6.

100. Stewart, supra note 82, p. 353.

101. The author of this paper conceived and negotiated the IPDC into being.

102. Flacks, Draft Report for Senator Leahy, supra note 10, pp. 41-42.

103. Kirk, International Copyright Symposium.

104. Compare Homet, U.S. Policy and International Information Flows , in Sterling, ed., International Telecommunications and Information Policy 82, 92 (1984) Japan, by contrast, has shown considerable training iaenuity. Stung by the discovery of Taiwanese counterfeit cameras--Canon, Olympus--in third markets, the Japanese have responded by sending technicians to Taiwan to teach original design and to help set up a government center to register and clear such designs before production. Wall Street Journal, August 2, 1094, p. 28.

105. Interview with John Eger, supra note 22.

106. Interview with Brenda Fox, supra note 21.

107. Interview with Truman Eustis, supra note 22.

108. Interview with Robert Wedgworth, Executive Director of the American Library Association.

109. Interviews with Hugh Donaghue, *supra* note 76; Joseph Genovese, *supra* note 6; Lewis Flacks, *supra* note 15; and Vico Henriques, *supra* note 41.

110. *Ibid*; interview with Peter Robinson, U.S.C.I.B.

111. Ervin, Humor of a Country Lawyer 126 (1983): Stewart, *supra* note 82, p. 352.

112. *CONTU Report* 79 (1978); Perle, "Copyright and New Technology" in *Symposium on the New Copyright Law*, 25 Bull. Coprt. Soc'y 191, 250 (1978); interview with Michael Remington and Thomas Mooney, Majority and Minority Counsel of the House Judiciary Subcommittee on Courts, Civil Liberties, and the Administration of Justice. See Lange, *Recognizing the Public Domain*, 44 Law & Contemp. Probs. (No. 4). The Congressional symposium featured participation by Judge Steven Breyer, Harlan Cleveland, and the ACLU. Common Cause was also invited but did not attend.

113. OTA Project Proposal on Intellectual Property Rights in an Age of Electronics and Information, March 8, 1984, pp. 4-5, 12, 17.

114. Interview with John Podesta, *supra* note 43; Leibowitz, *International Copyright Symposium*; The Information Economy Company, Inc., "The Information Sector International Trade Statistical Series"; Brinberg, *Information in the U.S.--An Industry Serving Industry*, in Sweeney (ed.), Information and the Transformation of Society 266, 269 (1982).

115. *CONTU Report*, pp. 27-37 (Hersey dissent); "Directors Guild Approves New Contract Raising Share of Videocassette Revenue," *Wall Street Journal*, July 5, 1984, p.5; *Whitford Committee Report*, ch. 11 (works made for hire).

116. UNESCO/WIPO Group of Experts on Unauthorized Private Copying of Recordings, Broadcasts, and Printed Matter, *Working Paper* 15 (1984); interview with Jon Baumgarten, *supra* note 26. This would be something of a variant on the ⊗ mark used by the counterculture in the early 1970's in publications like *Radical Software* to mean: "Copy freely, but give credit."

117. *Congressional Copyright and Technology Symposium*, pp. 13-15; Ploman & Hamilton, Intellectual Property in the Information Age 152 (1980); interview with Lewis Flacks, *supra* note 15.

118. *Congressional Copyright and Technology Symposium*, p. 8; Schrader, *International Copyright Symposium*. See *Hearings on Copyright and Technological Change*, p. 8 (testimony of Benjamin Compaine).

119. Schrader, *International Copyright Symposum*. See Part II C, *supra*, for a description of "information sovereignty" pressures susceptible to aggravation by new information techologies.

120. Hearings on Copyright and Technological Change 2 (opening statement of Chairman Kastenmeier); interviews with Vico Henriques, supra note 41, and Michael Keplinger, supra note 58.

121. CONTU Report, chs. 1, 5; Perle, "Copyright and New Technoogy," in Symposium on the New Copyright Law, 25 Bull. Copr. Soc'y 191, 250 (1978); interview with Arthur Levine, Esq., former executive director of CONTU.

122. Congressional Copyright and Technology Symposium 4-6.

123. Id, p. 13; Hearings on Copyright and Technological Change 8, 24, 72-73.

124. Id., p. 3. See sources cited at note 121, supra; interview with Jon Baumgarten and Eric Smith, supra note 26.

125. Ploman & Hamilton, supra note 117, page 150; interview with Michael Remington and Thomas Mooney, supra note 112.

126. Report of the Register of Copyrights, Copyright Law Revision v, 87th Cong. 1st Sess. (1961 ; compare Bogsch, supra note 32, pp. 5-6, 8 (1968).

127. H.R. Rept. No. 94-1476, p. 51 (1976).

128. Ladd, supra note 19, pp 294- 95. See the balance of this subpart and Part V C. infra.

129. CONTU Report, p. 79; Bogsch, supra note 32, pp. 7-8.

130. Congressional Copyright and Technology Symposium 7; UNESCO/WIPO Group of Experts, supra note 116, p. 15.

131. Book review, The New Yorker, July 16, 1984, p. 88. See Hearings on Copyright and Technological Change.

132. Cleveland, King Canute and the Information Resource, Intermedia, January 1984, p. 12.

133. Testimony of Joseph Coates, Hearings on Copyright and Technological Change 51-52; Krishnamuri, Copyright--Another View, 15 Bull. Coprt. Soc'y 217 (1968); Pool & Solomon, Intellectual Property and Transborder Data Flows, 16 Stan. J. Int'l Law 113 (1980). See also Pool, Technologies of Freedom 214-15 (1983).

134. See Gordon, Fair Use as Market Failure, 30 J. Coprt. Soc'y 253, 265-71 (1983) .

135. Interview with Robert Wdgworth, supra note 108. Pool & Solomon, supra note 133, pp. 129-30, would rest international intellectual property protection on conflicts of laws principle, which suggests an ability to follow the transaction.

136. Universal Declaration of Human Rights, Articles 19, 27 (1948). The author of this paper had a hand in phrasing those U.S. positions.

137. Interview with Michael Keplinger, supra note 58. The Soviets do award patents to foreigners.

138. Interview with Ralph Oman and Stephen Metalitz, chief counsel and staff director, Senate Judiciary Subcommittee on Patents, Copyrights and Trademarks; Hearings on Copyright and Technological Change 28-29.

139. Interview with Jon Baumgarten, supra note 26; Tracy, "The Search for Copyproof Software," Fortune, September 3, 1984, p. 83.

140. Schrader, International Copyright Symposium; interview with Lewis Flacks, supra note 15.

141. Interviews with Stanley Besen, economist, RAND Corporation, and Jon Baumgarten, supra note 26.

142. Interview with Brenda Fox, supra note 21.

143. Hoffman, The Software Legal Book, Part 1, B-2, B-3; Part IV; Appendices A-C, E-H (1984 ed.).

144. Interview with Stanley Besen, supra note 141.

145. Ladd, supra note 19, pp. 297-98; interview with Lewis Flacks, supra note 15.

146. Hearings on Copyright and Technological Change, passim; interview with John Eger, supra note 22.

147. Interviews with Congressional committee staffs, supra notes 112 and 138; interview with Michael Keplinger, supra note 58; Homet, U.S. Policy and International Information Flows, in Sterling (ed.), supra note 54, p. 90. See the closing two paragraphs of Part III B, supra. Curiously, the Senate Subcommittee was abolished after passage of the 1976 Copyright Act (to be resurrected in 1983), in the belief that its work was finished.

148. Congressional Copyright and Technology Symposium 16; interviews with Congressional committee staffs, supra note 112 and 138.

149. The concerns about judicial usurpation expressed by the House Subcommittee, in particular, have been well and thoughtfully addressed in some of the recent professional literature. See Hearings on Copyright and Technological Change 3 (Chairman Kastenmeier), 27 (Rep. Sawyer); Gordon, Fair Use as Market Failure, 30 J. Coprt. Soc'y 253, 265 & n. 59, 282-83 (1983); Perle,

(Note 149 continued next page)

149. (continued) "Copyright and New Technology," in Symposium on the New Copyright Law, 25 Bull. Copr. Soc'y 191, 250, 254 (1978). Ms. Gordon's is a prize-winning essay; and both she and Mr. Perle-- at that time the President of the Copyright Society of the United States--endorse legislative, not judicial, resolution of competing copyright interests "in the context of a broad base of knowledge and...philosophy." Ibid.

150. Hearings on Copyright and Technological Change 23 (testimony of Benjamin Compaine),, 71 (testimony of David Lange, Duke University professor of law).

151. Id., p. 123 (testimony of John Banshaff, George Washington University professor of law); interview with Michael Keplinger, supra note 58.

152. Ibid; interviews with Senate committee staff, supra note 138, and with Jon Baumgarten, supra note 26.

153. Remarks of Gerald J. Mossinghoff, Commissioner of Patents and Trademarks, at the American Bar Association Annual Meeting, Atlanta, 1983, p. 10; Kirk, International Copyright Symposium; interview with Senate committee staff, supra note 138, and Vico Henriques, supra note 41.

154. Interview with Michael Keplinger, supra note 58.

155. Winter, International Copyright Symposium; interviews with Kenneth Robinson, supra note 37, and Lewis Flacks, supra note 15.

156. Homet, Reshaping the U.S. Government for the Information Age, and U.S. Policy and International Information Flows in Sterling, supra note 54, pp. 73-74, 79, 95-97. Such an approach would be consistent with the thinking of the chairman of the House Foreign Affairs Committee, see Fascell & Schlundt, United States International Communications and Information Policy: A Crisis in the Making?, Northwestern J. Int'l Law & Business 486, 508-09 (1983).

157. Id., p. 95.

158. Elements of the model were suggested by, or consistent with, the following sources among others: Hearings on Copyright and Technological Change 28, 56 (Chairman Kastenmeier, witness David Lange); CONTU Report 79-80; Gordon, supra note 149; interview with Jon Baumgarten, supra note 26.

159. Universal Copyright Convention, Art. I; Tannenbaum, The Principle of "National Treatment" and Works Protected: Articles I and II, in Kupferman & Foner, Universal Copyright Convention Analyzed 15 (1955); Flacks, Draft Report for Senator Leahy 28; see Part II B, supra.

160. Berne Convention for the Protection of Literary and Artistic Works, Art. II; WIPO, Guide to the Berne Convention, paras. 2.4, 2.6 (1978); UNESCO/WIPO Group of Experts, supra note 116, pp. 5, 6; Boytha, International Copyright Symposium.

161. Baumgarten, Supra note 8, p. 38; interview with Lewis Flacks, supra note 15. There is by contrast a consensus among civilized states that "chip" technology should not be considered copyrightable. Genovese, supra note 41, p. 6.

162. Interview with Michael Keplinger, supra note 58.

163. Stewart, International Copyright in the 1980's, 28 Bull. Coprt. Soc'y 351, 373-74 (1981); Boytha and Winter, International Copyright Symposium.

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Homet, *Law-Making for International Information Flows*, and *Appendix: Transborder Data Flows and the Claims of Offended Sovereignty*, vol. 4 New York Law School Journal of International and Comparative Law p. 65 (1982).

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The New Electronic Technologies and International Intellectual Property Issues

by Richard Jay Solomon and Jane Yurow

[Contractor's report to the Office of Technology Assessment, United States Congress. Jan. 18, 1985. Revised May 7, 1985. Contract No. 433-9760.0]

> "The fact that much intellectual property has very little capacity to generate market power leads to considerable difficulty in arguments over the proper scope of rights. On the one hand there is the potential disadvantage of power over a market in the few really successful cases.... On the other hand, if the investment of resources to produce ideas or convey information is left unprotected, it will be prey to the attentions of a competitive imitator who will not be obliged to pay anything for what he takes.... The only way out of this dilemma is ... to make the best practicable estimate of the dangers that unjustified monopolies may produce; and, ... to assess the degree to which the claimant's investment will be open to dissipation if he is not accorded his right." [1]

I. Introduction

Summary.

Though the primary emerging international issues for the protection of intellectual property are essentially the same as the U.

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[1] Cornish, W.R., Intellectual Property: Patents, Copyright, Trademarks, and Allied Rights, Sweet & Maxwell, London, 1981, p. 22

This contractor document was prepared by an outside contractor as an input to an ongoing OTA assessment. It does not necessarily reflect the analytical findings of OTA, the Advisory Panel, or the Technology Assessment Board.

S. domestic issues, the demands of international trade policy add several measures of complexity not found domestically. In particular, the most difficult problems appear to be arising due to the historical segmentation of markets confronting a new convergence of media to create and deliver products. The new media inherently are difficult or impossible to protect from a technical standpoint -- as compared to the older media -- and resolution of many issues in an international trade framework will, of necessity, have to take an economic or political route. These politico-economic solutions often create conflicting goals in trade and related policies, which may make managing a coherent intellectual property stance intractable for the U.S. in the international arena.

Market Segmentation.

The world marketplace for intellectual products has historically been segmented. This segmentation is often different in form and substance than that found in isolated domestic markets because nations have different policies towards economic activity which affects intellectual works. These range from policies towards antitrust, media control and distribution, treatment of creative and artistic labor, to such strictly socio-political policies as censorship and access to information.

As has been discussed in previous documents, the electronic and computer-based technologies are converging and convergence does not inherently support such segmentation. This paper assumes acquaintance with these technical explanations. No attempt will be made herein to delve deeply into the subtleties and complexities of digital technologies. For this study, the contractors were requested to present a brief survey in order to aid in structuring further analysis of the international intellectual property rights issues related to the "changing role of information, and communication technology."[2]

The accompanying table (expanded from an earlier OTA report)[3] indicates where the points of friction may lie due to this convergence.

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[2] "Statement of Work," OTA Contract No.:433-0960.0, Oct. 1984.

Some fundamental comprehension of the implications and workings of the new computer-based technologies is essential to understand how, in the international environment, protection problems become vastly more complicated. The interaction of computer-based networks is the underlying issue in this sphere.

One of this paper's authors first broached the subject of international networks in an 1978 MIT study for the Organization for Economic Co-operation and Development. See Pool, Ithiel de Sola and Richard J. Solomon, "Transborder Data Flows: Requirements for International Co-operation," in Policy Implications of Data Network Developments in the OECD Area (OECD, Paris, 1980), pp. 79-139.

The intellectual property and computer copyright issues raised for the OECD were further expanded in: Pool & Solomon, "Intellectual Property and Transborder Data Flows," Stanford Journal of International Law, Summer 1980; Solomon & Pool, Issues in International Access to Computerized Databases, Office of Technology Assessment, 1982; and "International Database Issues: A case study of NLM's MEDLARS," in Branscomb, Anne, ed., Toward a Law of Global Networks, Longman (in press).

On convergence of technologies, see: Pool's Technologies of Freedom (Harvard, 1983), especially chapter 3; Solomon, "Computers & Copyrights," and Pool, "Whither Software Copyright?," in Greenberger, ed., Electronic Publishing Plus, papers from a conference held by The Washington Program of The Annenberg Schools of Communication in May 1984 (in press, Knowledge Industries Publications, 1985); and Solomon, "Intellectual Property and the New Computer-Based Media," OTA, August 1984 (an unpublished paper prepared for this current OTA study). The latter paper contains a detailed discussion of the digital computer technologies and the convergence of media.

It was the media differentiation of the past, abetted by national and cultural structural differences, which made it technically practical to segment markets, and to prevent or impede infringements of these "copy rights" across national boundaries. A simple example may be illustrated by the geographical market segmentation of books, records, and films whereby distribution rights are reserved for certain areas of the world. When the medium of duplication is capital intensive it is relatively easy to control distribution, even if the state offers no legal or police aid to the producer for maintainance of control. However, in an age where music, images, and type will be digitized and distributed via small, easy-to-transport and easy-to-duplicate media, or via invisible electrons on interconnected telecommunications networks, transborder control becomes hopeless.

In the not-too-distant future, as integrated services digital networks (ISDN) expand, protection of intellectual property will suffer devasting impacts. Since implementation, ownership and operations of ISDNs will vary depending on political and cultural considerations in different countries, adequate transborder control of content transmission in order to protect intellectual property will usually be impossible. Even today, some important digital networks are beyond control of national

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[3] See Solomon (OTA, 1984), op cit.

A TAXONOMY OF MAJOR TECHNOLOGIES FOR REPRODUCING INTELLECTUAL PROPERTY:
(Modified to show potential impacts in the international environment)

Types of Property	Storage Media	Transmission or Distribution	Replication Techniques	COSTS OF REPLICATION		Future Migration (INT'L IMPACTS)
				Today	Nearterm	
A. PRINTED TEXTUAL MATERIAL						
alpha-numeric text	print on paper	mail, parcel, etc.	xerographic	HIGH	LOWER	on-demand printing (DIFFICULT TO SUPPORT DIFFERENTIATED MARKETS OR TRANS-BORDER CENSORSHIP)
	bound book	"	"	VERY HIGH	LOWER	
	microfilm	"	"	HIGH	LOWER	
	printed material-alpha	"	re-set type	VERY HIGH	MUCH LOWER	optical scan; digital store
alpha + formulae	paper	"	"	HIGHEST	MUCH LOWER	(DITTO - ALSO BOOK PIRACY MAY INCREASE FOR HIGH-VALUE ITEMS)
+ graphs	"	"	"	"	"	
B. MACHINE-READABLE TEXTUAL MATERIALS						
text	machine readable	mail, parcel of media: disks, tapes, ROMs	computer copy to printer, VDT, etc.	MEDIUM	VERY LOW	expert-systems aided copying
"	"	telecomm (COLLECTION OF ROYALTIES DIFFICULT)		LOW	VERY LOW	(PUBLISHING & PERFORMANCE MAY BECOME SYNONOMOUS WITH ELEC. MAIL -- AFFECTING TREATY DEFINITIONS)
+ forms & graphics	"	mail media		MED-HIGH	VERY LOW	
"	"	telecomm (COLLECTION OF ROYALTIES DIFFICULT)		HIGH	VERY LOW	
+ photos	"	mail media		HIGH	VERY LOW	
"	"	telecomm link	"	VERY HIGH	VERY LOW	enhanced image processing

(ADAPTED FROM SOLOMON [OTA, 1984], op.cit.)

(continued on next page)

(continued)

A TAXONOMY OF MAJOR TECHNOLOGIES FOR REPRODUCING INTELLECTUAL PROPERTY: Effects of storage and transmission on total costs of replication. (MODIFIED TO SHOW INTERNATIONAL IMPACTS)

Types of Property	Storage Media	Transmission or Distribution	Replication Techniques	COSTS OF REPLICATION		Future Migration (INT'L IMPACTS)
				Today	Nearterm	
C. SOUND AND AUDIO SYSTEMS						
audio	audiodisk audiotape	mail, parcel	analog (to tape)	MEDIUM	LOW	digitally enhanced sound
"	digital media	telecommunications	computer copy	HIGH	VERY LOW	(PIRACY MAY GAIN BULK AFTERMARKET, IN CERTAIN WORLD REGIONS. MOST OF PRODUCER/ DISTRIBUTOR'S INCOME UP FRONT)
D. MOTION AND VIDEO SYSTEMS						
moving image	videotape, VCR	mail, parcel, videoshop	analog (tape-to-tape)	HIGH	LOWER	digitally enhanced image
"	videodisk	"	analog (disk-to-tape)	HIGH	LOWER	"
"	"	"	disk-to-disk	VERY HIGH	LOW	"
"	film/tape/live	broadcast (CATV, DBS, over-the-air)	analog (tape)	MEDIUM	VERY LOW	"
"	film	'bicycled', mail	optical transfer	VERY HIGH	LOWER	"
"	HDTV/film	"	electronic	HIGHEST	LOW	(LOCI OF PRODUCTION FOR MEDIA, CAD/CAM, ETC., LESS CRITICAL *) MAJOR EFFECT ON INDUSTRIAL, INT'L TRADE POLICY)
E. COMPUTER PROGRAMS AND LOGICAL PROCESSES						
logical processes (programs)	binary, non-volatile (disks, tape)	mail, parcel	digital	MEDIUM	LOW	expert systems
"	"	telecommunications	"	MEDIUM	VERY LOW	(DEFINITIONS NOT ADEQUATE TO COVER COMPUTER TECHNOLOGY IN BERNE, UCC, OTHER TREATIES.
"	volatile RAM	"	"	HIGH	VERY LOW	
"	logic circuit	mail, parcel	computer emulation	VERY HIGH	VERY LOW	REVERSE ENG'G OF CHIPS USING AI.)
learning systems	?	?	" (recursive)	VERY HIGH	LOWER	AI emulation of learning systems

entities, such as the software-defined BITNET and USENET.[4]

By the next decade, integrated digital systems -- some publicly accessible and others private -- will gain the capability of transporting and switching high-resolution video; at that time, it will be impossible to use national boundaries to enforce jurisdiction over any form of electronic-based intellectual work, ranging from mass audience films (videos) to textual creations. Potential solutions to copyright protection using these novel telecommunications systems are fraught with complexities. Side-effects are such that international agreement on the implementation of protection schemes may never be achievable.

Convergence.

Convergence and merging of computers and communications, blurring of markets, of legal definitions, of information products, and of the rights of producers is now a cliché, but the actual process of convergence and the impacts are not yet clear. We have found that this is especially true internationally, where convergence is not readily recognized by law or practice. The confusion in several policy documents discussed here, combined with the lack of participation by intellectual property experts in fora dealing with international communications and computer standards (and vice versa), is an indication of how difficult it will be to proceed with satisfactory solutions.

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[4] BITNET and USENET are advanced electronic mail systems connecting uncountable thousands of university, governmental, and high-tech corporate research installations the world over. BITNET consists of a set of compatible file transfer software residing on various types of machines, existing only as a virtual "network." Data may be transferred over any physical network, transparent to the carriers, which range from private international circuits to public telephone systems. Needless to state, there are no concerns to prevent copyright infringement in the architecture of such systems. They are the model for the future, and will be capable of transmitting complex graphics and full-motion video with the advanced network technology now being planned worldwide. For BITNET/USENET, see Information Technology Newsletter, Harvard University, Office for Information Technology, Feb. 1983, p. 3, and Sept-Oct. 1984, p. 3; for ISDN, see Solomon (OTA, 1984), op. cit.

International regulation of intellectual property is often suggested as a solution. But as one Australian authority has written, though the computer-based technologies have "revealed so many gaps and deficiencies [in copyright law] for which the remedy can only be regulation and supervision," this regulation would have to be "to an extent which may be beyond the powers of the executive and enforcement agencies."[5]

Internationally, regulation would require an unprecedented degree of cooperation. Without extensive study of the interlocking nature of the problems, it is not clear whether this would be a matter for trade negotiations, revision of international treaty commitments, or some other political solution.

An additional weakness, as expressed by the Swedish delegation to the OECD, is that "differences between national copyright law and the differing interpretations of copyright law by national courts could segment the international information market" even further, but not along the lines of the relatively stable relationships of the past.[6] That is, different treatments of copyright law, combined with the integration and convergence of technology, will permit numerous avenues to circumvent intellectual property protection in the future.

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[5] See 56 ALJ 621 (1982, Australia).

I.1. Critical issues today.

There are several issues today which are getting significant attention in world fora on intellectual property and on international trade. For convenience, they may be grouped as:

1) Fundamental definitions of property rights, specifically for the computer technologies: the intellectual work implied by programs, databases, and micro-circuits;

2) the growth of organized piracy of intellectual works, especially electronically-stored works, ranging from audio and video recordings to computer programs and microchips.[7]

3) The relationship of policy development on trade in services to that of international protection of intellectual property and to national policies on the information economy.

The areas are interrelated; for convenience, we will use this general structure for analysis in this section, but these separations are not rigid, and other structure could be used for analysis. (Section II is a survey of international treaties and conventions related to copyright; Section III discusses some significant issues in the context of international law and policy.)

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[6] OECD, "Copyright Law and Computerised Information," (Note by the Secretariat in response to a questionnaire), Paris, ICCP(84)23 scale 2, 5 Sept. 1984, p. 9.

[7] Piracy of books, planar and plastic art, protected processes, &etc., are also growing international problems. It is expected that with the advent of sophisticated computer and robotic technology, these intellectual works may begin also to fall under the rubric of "electronic-related" piracy in the future.

Besides international copyright, other related issues are discussed in the paper: the rights of authors and software creators; the interception of satellite signals; and technology transfer for developing countries. Piracy is discussed in Section III as a special challenge for international control.[8]

I.1 Fundamentals underlying intellectual property rights

In general, there is widespread, official, worldwide agreement that the originators or owners of intellectual property should be given financial incentives and other basic protections in order to encourage further production of intellectual works. As a corollary, piracy is universally condemned, though unevenly prosecuted. Therefore, while interpretation may vary, virtually all countries start from quite similar basic principles: in the West, the general concept is that rights should be protected for the "application of ideas and information that are of commercial value"[9] to encourage invention; and in the Socialist countries, the view is that "traditional rights of authors ... are implemented in such a way as to serve the public interest"[10].

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[8] Additional intellectual property issues, while important, are only briefly referenced in this report: the protection of cultural and folk art; the rights of performers; impacts on culture; and the relationship of intellectual rights to industrial (patent) rights, trade marks, and trade secrets. The specific details of their problems are not within the scope of our general focus and survey related to novel electronic technologies. However, our discussion does have general relevance to these other areas because of the potential wide impact of the new technologies, and the framework of issues is expected to have certain parallels.

However, Cornish emphasizes that:

> "no country favors conferring on the creator of an idea a perpetual property in it against imitators. The political and economic implications of such a privilege would be remarkable. Instead a set of limited forms of protection are fashioned against some types of exploitation... The root issue ... is whether the balance achieved by this approach is broadly appropriate to the economic needs of the country and the prevailing sense of what is just."[11]

New technologies have traditionally strained the definitions of intellectual property, but for the computer industries the politico-economic process has responded quite rapidly, if not adequately. While other novel technologies failed to gain rights protection for decades under either national or international legal systems, most nations have reacted quickly to the computer age, and have made strong positive efforts to put these ephemeral, but economically important works, under some sort of protection. This is true even where national legal interpetations related to the format of intellectual works have had to be bent to fit the digitized, invisible, algorithmic, and process-descriptive materials which define computer software.

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[9] Cornish, op cit, p. 6. See also Ploman, Edward W. and L. Clark Hamilton, Copyright, Intellectual Property in the Information Age, Routledge & Kegan Paul, London, 1980, esp. chaps. 2 & 3.

U.S. law reflects a combination of viewpoints with a strong emphasis on intellectual property as subject to general considerations of property law; that is, the emphasis is on protection against unauthorized uses, whether of a commercial nature or for some other purposes.

[10] Dozortsev, Victor A., "Copyright and freedom of self-expression of the individual," Copyright Bulletin, UNESCO, No 3, 1984, p 11.

[11] Cornish, op cit, p. 6.

I.1.1 Legal definitions under copyright.

The law recognizes different categories of protection for various types of intellectual property. In Section II, this paper reviews one category: copyright protections, as embodied in significant international treaties and selected national laws, and in terms of how they affect the U.S.

General agreement on the basic principles of copyright appears in the two principal international copyright conventions -- the Universal Copyright Convention and the Berne Convention on Copyright. UCC and Berne, and most national laws, have more principles in common than they may appear to have in conflict. In general, these copyright fundamentals give authors and writers:

> the right to ownership in their works. They are entitled to protection against unauthorized use of their work as well as a share in any earnings from its use by the public....But more than that, the rewards that copyright assures the individual creator ... provides a stimulus to creativity from which all society benefits. In promulgating copyright laws, legislators have recognized the needs of society for access to knowledge. They have therefore attempted to find a balance between the essentially conflicting needs of society for knowledge and learning and the rights of the individual

creator.[12]

Virtually every piece of legislation, proposed revision, and survey of copyright problems, begins with a similar statement of principles. Though the fundamentals are not an issue, questions addressed in differing national legislation are significant in interpretation. Cornish summarizes them as:

> "What types of subject-matter are to be included?
>
> "Is the right to be conferred only upon application to a government office?
>
> "How long is it to last?
>
> "Is it to be a right good only against imitators..., or is it a 'full monopoly' that even affects independent devisers of the same idea...?[13]

But the new technologies of reproduction, electronic transmission, and the stored-program computer are making answers more difficult, i.e.:

> what is an idea, what is its expression, and what is derivative?;
>
> how much of a copy is an infringement?; and,
>
> what is the actual work that should be protected?

These questions are the same as found in domestic controversies on the application of the new technologies.

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[12] UNESCO, The ABC of Copyright, Paris, 1981. Also note that Stewart, supra, states that even such rights as respect for the integrity of a work, or droit morale, (discussed supra) though not explicit in the UCC or in U.S. national law, is usually covered under other law and rules.

[13] Cornish, op cit, p. 7.

However, differences in applying basic principles are dependent on a complex, interwoven set of goals and priorities that are not the same for all nations. And sometimes disparate goals and priorities may be found within nations, as in the controversy in Japan on the proposed law to establish separate rules for the protection of different types of computer software.[14]

As Ploman and Hamilton note:

> "While most countries would maintain that they apply basic principles of copyright, the results may vary considerably from one to another. The high degree of international cooperation in this field has fostered a greater uniformity among national copyright laws than would otherwise be the case. But since the international conventions have been drafted so as to achieve a maximum agreement on common principles, these principles yield different results when they are applied in various economic and social systems."[15]

The fundamental copyright concepts and problems with computer definitions are discussed in more detail in sections II and III.

II.2 International trade

Intellectual property is difficult to break out of most aggregate trade statistics. For audio, video and motion pictures, and most non-U.S. government materials, one would assume that virtually all of the sales are of copyrighted or protectable property. But for data and computer software no methodogy has been devised to estimate the magnitude of the intellectual pro-

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[14] see Section III.1.2.1.

[15] Ploman & Hamilton, op cit., p.23 .

perty segment of high-technology trade. As a result the normal measures depending on literary and artistic trade severely understates the importance of intellectual property to the U.S. economy. This make it difficult to measure the impact of infringements on the U.S., in order to justify negotiations for relief in the appropriate world fora.

What can be stated is that software products account for a major share of data processing costs and "software production has proven an essential ingredient of any viable computer industry."[16] ITA adds that "software, often as much as hardware, sells systems."[17] But this only serves to confuse further delineation of the problem, for it is not yet clear in the international marketplace whose software is needed to sell what systems.

The arguments for and against certain types of software protection are the same as found on the national level: It could be that giving the software away, unprotected, will sell more U.S. hardware (or maybe vice versa). Software may support other types of services, which may have even more importance to the U.S. trading posture; in another U.S. Department of Commerce report, it is claimed that the international balance of trade "has in fact been positive for all years in the last decade but 1977, 1978 and ... 1982" if services are included with merchandise, although, the report admits "statistics on services are not as well documented."[18]

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[16] ITA, The Computer Industry, op cit., pp. 20-21.

[17] ibid., p. 41.

I.2.1 Trade in Services

Although the national bases for protection of intellectual property may be cultural as well as economic, the significant international issues related to protection of intellectual works appear to be in the sphere of international trade. According to the U.S. Trade Representative, "the United States believes that intellectual property should be made a part of future GATT (General Agreement on Trade and Tariffs) negotiations."[19] However, the USTR states that if intellectual property becomes part of such negotiations "it would be a topic in itself, not as part of negotiations on trade in services."[20]

This policy might well be carefully reconsidered since intellectual work of all types is becoming an integral part of services. This is expecially true of technology-related services using expert systems, providing access to "intelligent" databases and data interfaces, and the application of artificial-intelligence machine-design functions. With AI and knowledge-based heuristic systems, it may be difficult to discriminate between human and mechanisitic inputs, further muddling analogies based on conventional trade negotiations and agreements. Even banking, accounting, legal services, and most forms of non-techology-related services are expected to use more and more computer-based intellectual works of these types.

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[18] Salaman, R. K. and E. C. Hettinger, "Policy Implications of Information Technology," NTIA Report 84-144, Feb. 1984, p. 21. Further statistics are available in OECD reports, in particular, "Software...," op cit.

[19] Letter from Alice T. Zalik, Office of USTR, to Lauren Ackerman, OTA, March 18, 1985, p. 2.

[20] ibid.

The complexity of such totally innovative forms of intellectual works offer a host of novel and untested topics for international trade negotiations. This must be studied with extreme care, for the technologies and their applications are too new to determine what their impact will be on trade, and what would be the best policy for the U.S. national interest.[21]

In evaluating the potential hazards of different policies for international trade in services, it is important to discard all presumptions about the nature of work, trade, and national sovereignty, and begin thinking about the potentially radical implications of the electronic technologies. As one of the authors of this paper has already noted:

> "The digital computer is not simply a more efficient extension of old means of communication, nor just a better way to manage information. The stored-program, electronic digital computer is a unique device in the history of

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[21] While little has been written about this subject to determine specifically what U.S. policy is, or should be, the 1984

all presumptions about the nature of work, trade, and national sovereignty, and begin thinking about the potentially radical implications of the electronic technologies. As one of the authors of this paper has noted:

> "The digital computer is not simply a more efficient extension of old means of communication, nor just a better way to manage information. The stored-program, electronic digital computer is a unique device in the history of technology."[22]

And, even more important for international trade policy:

> "...the combination of the digital computer and the growth of [digital] communications networks poses a unique dilemma... This arises not so much from the ease of digital copying, the automaton in the machine, nor from its recursive qualities; *the problem lies in scale, speed, and the power of network technology*."[23]

The technological changes in computer-based telecommunications makes it imperative to examine conventional policies regarding international trade, and trade in information or services. National trade policy based on territorial sovereignty may yield to what Edward Ploman calls "informational sovereignty." One example he gives, which has obvious effects on national property values in information, is:

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[22] Solomon, Richard J. in *International Networks*, February 1984, p. 1. Also see Solomon (OTA, 1984). To summarize, this statement is based on the power of general-purpose architecture of the so-called von Neumann stored-program machine. This has the capability of: imitating and replicating any other machine process (according to Turing's theorem); of being recursive and self-learning (following automata theory); and, its program being, by definition, *functionally equivalent* to a machine. The use of stored-program computers blurs our earlier presumptions of the relationships between function and process, or between information and its expression; often the idea *is* its expression, another way of saying algorithms are equivalent in machine language. (Admittedly, some courts have not ruled with any understanding of this process). To wit: "Machines,... are not merely law-abiding, they are embodiments of law" (Weizenbaum, Joseph, *Computer Power and Human Reason*, Freeman, 1976, p. 40, passim).

[23] Solomon (OTA, 1984), p. 1. Emphasis in original.

> "In the UN Outer Space Committee debates have focused on the rules that should govern not the collection of data via satellites but rather the use of information gained from these data. Should ... NASA have the right to sell information about another country -- information that might reveal oil or mineral deposits -- to a third party, say an American mining or oil company, without the knowledge and approval of the country in question? Similarly, the information gained from satellite data about the failure of crops in certain parts of the world will make it possible for a grain dealer to buy in the commodity exchanges in the expectation of higher prices from needy countries....
>
> "[It is] clear that the influence of communications technology, particularly in combination with computer technology, has become a principal agent in transforming modern conceptions of the nature of sovereignty. *The impact of these technologies has been a decisive factor in transforming traditional views of sovereignty which have been understood and expressed in geographical and territorial or spatial terms into a new kind of concern about communications or informational sovereignty or integrity.*"[24]

Presumptions ought not to be made about employment structure, or location. Just as modern transportation made the location of manufacturing infrastructure less dependent on natural resources, highspeed computer-communications is changing the bases for location of intellectual resources. The nature of the computer-aided design/computer-aided manufacturing (CAD/CAM) process implies that labor-intensive electronic design can originate in low-labor-cost areas, such as India, with the electronic circuit database transmitted for manufacture to a remote, robotized "silicon foundry," perhaps in California, and the final product then shipped anywhere.[25]

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[24] Ploman, Edward, *Space, Earth and Communication*, Quorum Books, 1984. Emphasis added.

To whom would the largest economic gain flow with such novel types of value-added intellectual work? What position will the U.S. find itself in trade negotiations when this technology comes to pass? The advantages of infrastructure which permits the ready export of intellectual value may, in the future, go to different countries than that of today's industry. These uncertainties must be carefully weighed in any negotiations on intellectual property and trade in sevices, especially in light of future U.S. intellectual resources and intellectual handicaps.

In an related example, the ITA notes a potential problem regarding U.S. intellectual input for advanced semiconductor design in the 1980's:

> "...foreign competition will intensify as nearly all countries will seek ways to develop and produce semiconductors to nurture industrial growth.... the United States will probably graduate proportionally fewer electronics engineers than Japan. Furthermore, U.S. engineers will continue to seek management positions much sooner than their Japanese counterparts. Consequently, it will remain extremely difficult to keep a topflight U.S. design team together long enough to maintain essential continuity in a design project..."[26]

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[25] See International Networks, Nov.Dec. 1983, p. 13.

[26] U.S. Department of Commerce, ITA, The Semiconductor Industry, April 1983.

International Networks.

Telecommunications is clearly changing world interdependencies, and changing them in a more rapid fashion than when past economic discontinuities appeared. Though this point takes us somewhat astray from a distinct discussion of international intellectual property rights, it does not take too much imagination to understand that many of the international trade ground rules are being altered for the same reasons that technology is making protection of intellectual work more difficult and complex.

There are too many unknowns to predict precisely what will happen to manufacturing and international trade, and whether greater or lesser protection of selected intellectual works will be best for U.S. national interest. If the U.S. remains predominant in mass media visuals, we might want greater protection for whatever medium replaces film and television. (And future protection of video distribution might be better achieved by pursuing non-uniform technical standards which permit continuation of segregated markets.) On the other hand, if more basic technology is generated overseas than in the U.S., we may want lesser protection for technical concepts, especially if an "expression" of an computer-related intellectual work becomes equivalent to its underlying "idea."

It may not be wise to extend today's paradigms about technology and industry to the uncertain future. And though we argue that the future will not be a simple extension of the past, Cornish offers some interesting observations of how intellectual property protection has already had subtle influences on protectionism, yielding unfair trading advantages:

> "the growth of trade competition ... has brought ever-increasing advantages to those in the van of innovation. Intellectual property rights, which help to sustain the lead of those with technical know-how, with successful marketing schemes, with new fetishes for pop culture, have come to foster immense commercial returns.... But in some of these fields particularly, success has been accompanied by advances in copying techniques which make piracy possible on a scale that is just as new. The resources of existing legal techniques are under considerable strain. This is one reason why today there is a *profusion of different and sometimes conflicting demands, some for new and some for improved rights*...." And,

> "*The obvious purpose of intellectual property is to give protection against rival enterprises which would otherwise sell goods or provide services in direct competition*. In international trade these rights have acquired a separate significance. In many cases, by adopting the appropriate legal technique, goods ... can be prevented from moving from one territory to another, a barrier of private rights can be set up against imports or exports which is as effective as an embargo or tariff imposed by a state. The procedure is often more effective than limitations on movement imposed by contract."[27]

The new technologies generate conflicting demands. Users interpret "fair use" doctrines differently than producers, for example, for computer software. The meaning of derivative works is unclear when the concept of databases is applied to computerized information. And the economic structure of information further strains past conceptions of trade. These are discussed next, and in more detail in following sections.

I.3.2 Information Economics.

Because of the peculiar paradox of the economics of trade in information, as compared to the economics of trade in conventional commodities and merchandise, any unilateral agreement on trade in information-based services may move nations into untested sets of negotiating positions. Even if the computer were not a sufficiently radical tool changing work and trade practices, the nature of electronically-stored and transmitted information alone would have created contradictions in negotiations on intellectual property trade.

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[27] Cornish, op cit, p. 14 and p. 23, respectively. Emphasis added.

Researchers in this area begin by stating that information *is not the same as other forms of material property*. The most basic reasons have to do with our conventional paradigms and shibboleths about supply and demand: Because information increasingly is stored so that it has extremely low or zero incremental cost for duplication, to talk of scarcity of information supply is meaningless. Yet, while an *information resource is not depleted after use*, there is a paradox: the costs of production of information may be quite large.

What incentive will producers have to create and disseminate information products if they cannot control supply or access? Conventional justifications formerly used to determine cost, price, value, and demand, and to allocate scarce resources, break down where no goods are manufactured and no natural resources are depleted.

Information economics is still an uncertain field, and its function in developing policy for international trade is not understood. Adding uncertainty about economics to the confusion among jurisidictions about how to legally define computerized intellectual property, to the lack of control of information transmitted on telecommunications networks, and to the growth of outright piracy based on new copying techniques, demonstrates the difficulty of making a coherent U.S. policy for international intellectual property rights. Furthermore, such international trade policies will have to mesh with disparate U.S. domestic interests still undefined.[28]

I.4 Some additional caveats.

Brought to its penultimate level, the economic distortions created by intellectual products might change and complicate multilateral trading agreements in ways that are not in the United States' national interests. If these issues are ignored, then the final stage may well precipitate a crisis for U.S. hegemony in high-technology trade, given that the primary component of that trade will be value-added intellectual work.

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[28] Studies of the economics of information are expected to become an essential part of policy-making for international trade in services and of any policies related to defining intellectual property. However, so little is understood about its economic ramifications (and even less is documented in intellectual property discussions), that this report cannot do more than point in the direction of more study.

Work in this area is truly international in scope. For an introduction see: Rubin, Michael, Information Economics and Policy in the United States, Libraries Unlimited, 1983; Rubin, "The Information Sector and GNP," Information Processing and Management, no. 4, 1981, pp. 163-94; Machlup, Fritz, Knowledge and Knowledge Production, Princeton, 1980; Pool, Inose, Takasaki and Hurwitz, Communications Flows, University of Tokyo, 1984; OECD, Information Activities, Electronics and Telecommunications Technologies, 1981; Pool, Technologies of Freedom, op cit; Nora, Simon and Alain Minc, Report on the Computerization of Society (to the President of France), 1978; Ito, Youichi and Koichi Ogawa, "Recent Trends in Johoka Shakai and Johoka Policy Studies," Keio Communication Review, No. 5, March 1984, pp. 15-28 (johoka shakai is a rough translation of "information society"); and, Ernst, Dieter, The Global Race in Micro-Electronics, Campus Verlag, Frankfurt, 1983, Chapter 3.

Yet, it is difficult to argue for full protection of intellectual works, without qualification. Cornish notes that while protection for intellectual property rights may be justified as "the exclusive right to perform some defined activity"[29], such market power must be balanced against general goals to promote and encourage dissemination of "the Arts and Sciences." And, some would add, to promote the dissemination of ideas and information. Certainly, we can expect that other nations will adopt that view as a fundamental negotiating position when intellectual property and trade in services are raised. Agreement can hinge on definitions, particularly hard with computerized media. As the ITA states in a discussion of international protection of computer software:

> "the vagueness of many foreign provisions and the inherent competitiveness of the industry may make injury to U.S. producers impossible to prove under GATT.... such action could even have ambiguous short-term consequences for U.S. interests.... such unilateral action raises the spectre of a full trade war, an eventuality that could seriously damage the U.S. economy across a much broader range of products and industries."[30]

The following sections discuss in more detail some of these definitional problems, as found in existing agreements.

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[29] Cornish, p. 21, and passim.

[30] U.S Dept. of Commerce, International Trade Administration, The Computer Industry, April 1983, pp. 46-7. Emphasis added.

II. International Copyright Law

Copyright laws generally have no extraterritorial operation. Consequently, copyright problems are usually resolved under the national law of the country in which the infringement occurs (if that country has copyright protection) or with reference to bilateral treaties or multi-lateral conventions. Some national laws may unilaterally provide protection to intellectual property created or produced in another country but this is not the general rule.[1]

The international conventions recognize three approaches for dealing with copyright: 1) by granting rights to which there are no exceptions; 2) by describing rights subject to national legislation; or, 3) by defining a situation and making its application optional with member countries.[2] In other words, the conventions include: 1) adherence to certain specifications which are essential to ratification of the convention; 2) minimum standards to be interpreted in national law, representing the norm; and, 3) an occasional provision subject to voluntary compliance. The provisions examined in this paper exemplify all three approaches.

II.1 Fundamental Copyright Concepts

Although certain concepts are fundamental to national laws, legal systems may view them differently, as we noted in Section I. In this circumstance, conventions and treaties serve to harmonize differences, or to create exceptions. Justification for the copyright system, formalities, first publication, and neighboring rights, are among the concepts rationalized differently or which enjoy different status from country to country.

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[1] Melville B. Nimmer, Nimmer on Copyright. Volume 3. Matthew Bender, New York, 1984, pp. 17-5 to 17-9.

[2] Stewart, S. M., International Copyright and Neighboring Rights, London, Butterworth's, 1983, p. 48.

The various viewpoints must somehow be bridged in order for international agreements to be effective. Justification for copyright offers the best example of how, despite basic philosophical disagreements, countries can come together and decide on mutual protection of a compelling economic and cultural interest.

Stewart identifies four types of justification for copyright which are generally identified with four different legal traditions.[3] Consequently, these are at the root of national copyright systems, and are engrained in the political systems which foster them. These viewpoints must be accommodated in international agreements if creative works are to be protected by copyright. These are the **natural justice** (droit d'auteur, sometimes translated incorrectly as merely "copyright"), economic, cultural, and social bases.

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[3] Stewart, op. cit., pp. 3-4. Other commentators may disagree with this characterization. We offer it for discussion as the view of one eminent scholar in the field.

II.1.1 Droit d'auteur.. "Authors rights" is a concept found in Continental law (France and Germany being its outstanding originators) and in the law of some former colonies. Its legal theory is centered around the protection of certain kinds of creative works which are felt to be an extension of the creator's personality. This has led to the express recognition of a "moral right" (droit morale) which permits authors to object to the distortion or abuse of their works by others and to insist upon being accurately credited as the creator of the work. Author's rights also includes basic rights of economic exploitation. The concepts are complex, but largely irrelevant at the international level due to international agreements. [3a]

Author's rights are inalienable and theoretically unrestricted, although in practice some restrictions are necessary to assure investment in, and marketing of, the various derivations of the original work. For example, if an author of a novel had ultimate control over the film version of his novel, this could limit investment in producing the film because the investors would prefer to trust the judgment of producers and directors about the film market. France, which takes droit morale very seriously, but also has an active film industry, has managed accommodations of the principle.

II.1.2 Moral rights and computer software.

The Japanese Ministry of International Trade and Industry (MITI), which is interested in replacing traditional copyright law with sui generis laws in respect to computer software, has stated that "if a special moral right is granted with respect to programs, it is likely to impede their development and distribution." MITI recommends that "since the program is an economic good which will play an extremely important role in the highly advanced information-oriented society in the future, there is no reason to establish the provisions for special protection of the entirely exclusive interests of the producer, compared with the cases for other economic goods.... Should it be necessary to recognize the moral right, then it is believed that protection under the general principles of the civil code is sufficient." Their point is of concern to virtually all users of software who will agree with the thrust of MITI's proposal that "modifications and copies should be allowed for the person who has received the approval for the right of use to an extent for the use of the software for the user's use [sic]."[4]

[3a] Letter from Acting U.S. Register of Copyrights, Feb. 22, 1985.

Adherence to droit morale is required by the Berne Convention (Article 6 bis). Although many aspects of this right are protected under common law or statute in the United States, courts have never articulated this theory coherently.[5] The absence of this doctrine in U.S. law is a restriction on U.S. adoption of the Berne Convention. But the United Kingdom, which also has a common law tradition, is a member of Berne. This is discussed in more detail below.

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[4] Japanese Information Industry Committee, Industrial Structure Council, "Aiming Towards Establishment of Legal Protection for Computer Software," Interim report, Dec. 1983, p. 17. English translation by the EC's Information Technology task force.

We discuss further, in section III.1.2.2 infra, the implications of MITI's proposals to change the copyright laws in respect to computer software, and in Sects. II.2.1, II.2.3 infra., for some other implications of moral rights.

[5] See Phyllis Amarnick, "American Recognition of the Moral Right: Issues and Options," in ASCAP Copyright Law Symposium, v. 29, Columbia University Press, New York, 1983, p.32.

II.1.3 Economic or Copy Right. Anglo-Saxon law, as typified in the U.S. copyright system, is based on the **economic rights**, or "copy rights" in intellectual works. Its general approach is that "whoever takes the initiative in creating the material and makes the investment to produce it and market it, taking those financial risks that such activities involve, should then be allowed to reap the benefit."[6] This concept has influenced the neighboring rights conventions which have members from Continental as well as Anglo-Saxon legal systems.

Both droit morale and economic-based systems, however, presuppose a free market economy and grant high levels of protection. This is not necessarily true of the other two viewpoints, cultural and social:

II.1.4 Cultural.

The cultural basis considers that intellectual creations are a national asset and encourages creativity in the public, rather than the individual, interest.[7] It characterizes much of the attitude toward intellectual works in developing countries, although many of these countries' laws are also influenced by Continental or Anglo-Saxon legal traditions as well. Developing countries generally do not accept the "author's exclusive right" theory of copyright protection, but believe that copyright law should serve the community interest and facilitate access for development of education science and culture.[8] The status of developing countries vis-a-vis Berne and UCC, and the attitudes towards piracy of intellectual works, are discussed further in Section III.3 infra.

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[6] Stewart, op. cit., p. 8

[7] Id., p. 3.

II.1.5 Social.

Adherents to the social approach believe that the dissemination of creative works is a force for social cohesion and that, consequently, creators render a social service. The Soviet-bloc countries, particularly the U.S.S.R., typify the embodiment of this theory into legal systems which regards copyright as "an instrument for the management of the cultural processes." Economic rights of authors are secondary but moral rights tend to be respected. Because the publication of original and derivative works is done exclusively by the State, there is a strong affinity between copyright and State censorship.[9] Despite this radically different approach to protecting works, the U.S.S.R. is a Member of the UCC along with the U.S. and many Continental countries, and the Soviets have modified their law in some respects in order to participate. Other Soviet-bloc and socialist countries participate as well in the Berne Convention.

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[8] Nora Maija Tocups, "The Development of Special Provisions in International Copyright Law for the Benefit of Developing Countries." Journal of the Copyright Society of the USA, Apr. 1982, p. 408.; see Dozortsev, op cit, for the Soviet view.

[9] Stewart, op cit, pp. 4,10; and also see Dozortsev, op cit., for an exposition of this rationale from the Soviet viewpoint. The censorship aspects of the use of copyright are muddled in Marxist-Leninist theory and have troubled some Western commentators, particularly when confused with statements regarding the "New World Information Order" (NWIO) and the propensity of some developing countries to desire a rationale to manage information. [See Mustapha Masmoudi, "The New World Information Order," in Gerbner & Siefert, eds., World Communications: A Handbook, Longman, 1984, pp.16-18.]

It should be noted that even in the Anglo-Saxon tradition, (continued)

II.2 Significant Conventions and Treaties.

There are several international agreements of significance to the U.S., either with the U.S. a party or because the subject or operation of the agreement has an impact on U.S. intellectual property or related concerns. We will briefly describe these agreements so as to identify important general international concerns for the United States, and to later examine some specific, currently pressing issues related to new technologies.

(footnote 9, cont'd)

the original purposes of copyright was to halt the spread of seditious and heretical ideas, in the realm of Philip and Mary [Blagden, The Stationers' Company, 1960], and technologic evolution may encourage the return of this goal [see Solomon, op cit, pp. 2-4, on the problems related to the loci of control of publication]. The hidden, and very confused agendas of the NWIO can only be briefly touched in this paper, and are only cursorily discussed in later sections in respect to copyright issues and the developing countries.

These copyright and neighboring rights agreements include the Berne Convention, the Universal Copyright Convention, the Rome Convention (on piracy of phonograms), the Phonogram Convention, and the (Brussels) Satellite Convention. There are also some provisions of the European Communities' Treaty of Rome which have an impact on copyright as analogies for potential future agreements which may affect the U.S. The Inter-American Copyright Agreements, to which the U.S. is a signatory (Buenos Aires, 1910), have been largely supplanted by the UCC.

Most of the copyright and neighboring rights conventions contain the right of national treatment, to which there may be only specified exceptions. This implies assimilation of foreign authors and their works to the legal status of nationals and works first published on the national territory. That is, **each Party must accord the works created in any other Party country the same legal rights as it accords its own nationals.** Most international conventions designate the substantive area to protect, and then use national law for protection. Consequently, **the level of protection can vary substantially among Parties.**

The conventions, however, extend national treatment to provide minimum rights which must be granted to foreigners even if they are not a part of national law. This has tended to more or less equalize domestic legal copyright and neighboring rights systems at least among convention signatories.[10] In reviewing the conventions it is important to keep the concepts of national treatment and minimum protections in mind.

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[10] Stewart, op. cit., p. 40.

II.2.1 Berne Convention for the Protection of Literary and Artistic Works (September 9, 1886).

Berne is the oldest copyright convention. It provides a high level of protection and a very comprehensive set of rules, and has the most signatories of any of the conventions. It covers copyright comprehensively, but does not address neighboring rights such as those of producers of records, and those which are derivative of authors rights. It may not cover all segments of a transmission of copyright works by satellite.

Berne has been administered since 1970 by the World Intellectual Property Organization (WIPO), a United Nations' specialized agency located in Geneva. (Although the U.S. has never joined Berne, for reasons discussed below, the U.S. is a Member of the Paris Convention for the Protection of Industrial Property which is also administered by WIPO.

Berne grants to authors reproduction and translation rights, as well as the public performance right.[11] With the advent of new technology it has granted recording, film, broadcasting, and wire diffusion rights, but only to the creators of works using these media. It probably also protects computer programs, though, as we discuss in Sect. III.1, definitions of what is a computer program may vary.

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[11] See Gotzen, Frank, "Performers' Rights in the European Economic Community," EEC, 1977, for a general comparative study of this subcategory.

Protection depends on recognition of these rights in national laws. While Berne protects collections (or compilations) it is unclear whether this includes online electronic information services, and is particularly unclear about any other type of computerized database, as discussed in Section III.1.1.5, infra.

II.2.2 The U.S. and Berne

Berne's minimum requirements, from which there are no exception, include droit morale and a prohibition on the imposition of formalities upon the acquisition, exercise or enjoyment of copyright. These represent important limitations on U.S. participation in Berne. U.S. law requires registration of copyright for certain purposes. Even though these requirements were lessened in the 1976 Copyright Act revision[12], Berne's minimums may be still too demanding for the U.S. to comply.

The moral right and registration right limitations of Berne have many complex ramifications for various of the new technologies. Other countries, as well as several international fora, have begun to examine these areas more closely. Computer-based works, for reasons explained previously, require special forms of registration for evidence of their uniqueness and to prove priority of creation. Berne leaves a large loophole, ignoring how documentation may get fudged with computer-related materials.[12a]

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[12] The Semiconductor Chip Protection Act of 1984 affords sui generis protection for computer chips -- a different model of protection, but which requires registration; see Sect. III.1.3 infra. where we discuss this novel form of protection for what is essentially computer software in a different form.

[12a] See Solomon (OTA, 1984), op cit.

The other issues involved in potential U.S. membership in Berne relate to our relationship with the UCC now that we have dropped out of UNESCO (the UCC's administrator), difficulty of dealing with Berne countries over the issue of piracy, and possible resentment towards the U.S. for not carrying the full weight of WIPO costs. We will deal with several of these issues specific to Berne next, and other more generic issues in succeeding sections of this report.

II.2.3. Moral rights. While the U.S. does not recognize moral rights explicitly as part of its copyright law, one commentator has identified the laws of breach of contract, invasion of privacy, defamation, and unfair competition, as protecting authors against embarrassment or economic loss resulting from misuse or distortion of creative works by third parties:[13]

Amarnick suggests that there are two threshold questions with respect to moral rights: 1) may an artist object to any change, however slight, for any type of use? Berne answers this "no", according to Amarnick, thereby putting a ceiling on an artist's ability to use the doctrine to protest against minor changes made by the transferee of a work. And 2), may an author enforce a moral right after an assignment has been made for valuable consideration? Apparently Berne does not address this latter question, but national laws generally account for the interests of those wanting to make active use of the creative works of others. At the same time, such use would be protected against flagrant distortions or mutilations that dishonor an author.[14] Therefore, if, as some have argued, U.S. law already protects these rights, then accommodation to the moral rights principle of Berne may not be difficult.

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[13] Amarnick, op. cit. p. 67. This position was reiterated in the Recording Industry Association of America (RIAA) presentation to the State Department on U.S. adherence to the Berne Convention, Oct. 15, 1984, at pp. 9 and 10; see footnote 22 infra.

Also see our discussion of moral rights Sect. II.2.3 supra.

Moral rights may conflict with specific U.S. industrial interests, and it can be expected that different interest groups will respond differently as to U.S. membership in Berne. For example, the motion picture and broadcast industries have stated their concern that moral rights legislation would disable the conduct of their business which involves the regular modification and reformulation of authors' works[15]. However, the MPAA seems to have ameliorated this position recently (see footnote 22 infra.). And, as we noted above, in the discussion of moral rights for computer programs stimulated by MITI's controversial proposal for computer copyright in Japan, the right of software creators to control use should be upsetting to U.S. computer users, as well. Software authors, on the other hand, may prefer the Berne position in terms of giving them more leverage over distributors worldwide. As yet, there is little material on U.S. industrial viewpoints towards the subject of moral rights and software.

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[14] ibid., pp. 45- 50.

[15] op. cit., p. 40. But see II.1.1 supra on French motion picture industry position.

II.2.4 "Back Door to Berne". Although the United States cannot, under current law, be a member of Berne, it acquires many of the benefits of Berne protection through what is often called the "back door to Berne." Since the Berlin revision of Berne in 1908, protection for authors is provided "not only in case of first publication, but also in cases of simultaneous publication in a Berne nation by nationals of nonmember states."[16] Some countries may resent the U.S. using Berne this way and not contributing to the costs of its administration.

Despite Berne not providing comprehensive coverage for the new technologies (as noted above), the increase of worldwide piracy stimulated by the use of the new technologies has stirred the ongoing debate about whether the U.S. should take steps to join Berne. Though the UCC has many members in common with Berne, it would strengthen the U.S. position to be able to voice its concerns about the new technologies in both world forums. This has become even of more concern since the U.S. has dropped out of UNESCO (the administrator of the UCC since the treaty was written). While the legal questions may be clear as to U.S.

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[16] Copyright Law Reports, Commerce Clearinghouse Inc., para. 6050. But the definition of simultaneous publication varies under different versions of Berne. See text at 6025, 6050. See also "To Secure Intellectual Property Rights in World Commerce," U.S. Copyright Office, September 21, 1984, p.27. Cited infra as "Copyright Office."

rights under the UCC treaty, as we discuss later, the U.S. representations on joint UNESCO/WIPO committees may take the appearance of being "illegitimate," even if within the U.S. rights under the UCC's treaty provisions.[17]

II.2.5 Pros and cons. As we have illustrated, the issues concerning whether the U.S. should or should not join Berne are quite complicated, made more so by the new technologies which are difficult to expand or trim to fit into Berne's Procrustean Bed. (These technology-related problems are not unique to Berne, but are unilateral and universal under copyright law[17a].)

Some U.S. interests consider that the changes in law necessary to comply with Berne would do damage to the U.S.'s traditional view of copyright protection. But others see Berne Membership as giving the U.S. a better position in international policy-making for trade and for control of infringements. Two successive reports by a subcommittee of the American Bar Association have summarized the principal political and legal issues, problems, and opportunities in relation to the U.S. and Berne. The first report, in 1982, listed several problems, including:

- The elimination of formalities may require the elimination of compulsory licenses in U.S. law;
- The uniformity in copyright treatment is not achieved by

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[17] This discussion is based on interviews in December 1984 with several intellectual property officials at different agencies in Europe. See below about RIAA's and the MPAA similar concerns in respect to world trade issues.

[17a] See Solomon (OTA, 1984), op cit, and Section III.1 infra.

Berne's patchwork of national law protections;

- Moral rights requirements may place expensive burdens on copyright users including those who do substantial adaptation of literary or musical works for different media; and,
- Berne is "becoming a tool of international activism tending to politicize previously non-political intellectual property issues" and may be threatened by differences of opinion over the protection of copyright interests in the new technological environment.[18]

The same ABA Subcommittee was charged in the following year with listing the advantages of the U.S. joining Berne. These include:

- Berne membership would eliminate formalities for perfecting a copyright interest that create pitfalls for authors and create involuntary copyright forfeitures;
- It would provide uniformity of international copyright protection because a work protected in one Berne country is automatically protected in all the others;
- It would give express recognition to authors' moral rights and protect against mutilation of their works; and,
- The U.S., as a world superpower and leading supplier of copyrighted works has a special obligaton to join other countries in a unified copyright bond.[19]

In general, the contradictions inherent in the international copyright issues make it difficult to ascertain the extent of either support or objection among U.S. interests for joining Berne. Further, there have been no conclusive economic or political studies available as to whether it would be in the U.S.'s vital interests to join, not join, or take some other course to protect U.S. intellectual property worldwide. A recent attempt to summarize major U.S. and international trade barrier studies on service industries which rely on intellectual property merely states that infringement was "the most important trade barrier" and that many countries "do not recognize or enforce the protection of patents and copyrights."[20] Precisely which copyright infringements were most important in the raising of trade barriers were ignored in this report. However, it was made clear that "these problems were exacerbated by the development of new distribution technologies ..., [and] inexpensive duplication," so presumably the main concern was with conventional replication rights of performances in their entirety.

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[18] Committee 302, ABA, "International Copyright Laws and Treaties", 1982, p. 148.

[19] Committee 302, ABA, 1983, p. 131- 132.

Despite these problems of detail, current tendency seems to be in favor of the U.S. joining Berne, perhaps accelerated by the withdrawal from UNESCO. Though the 1982 ABA report indicated that interest in the issue of U.S. membership in Berne is waning,[21] recent communications from other industry spokesmen indicate that this issue is still very much alive. In memoranda to the State Department, both the Motion Picture Association of America (in a position apparently contrary to earlier statements) and the RIAA supported U.S. affiliation with Berne claiming that current UCC protection is considered inadequate to protect copyright even in UCC member countries. RIAA, in particular, expressed concern about protection of U.S. rights solely through a treaty administered by UNESCO. Both presentations considered that the U.S. position in world trade would be strengthened by Berne membership, because the Berne provisions are more in line with current aggressive U.S. trade policy than is the UCC.[22]

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[20] CBS Inc., "Trade Barriers to U.S. Motion Picture and Television, Prerecorded Entertainment, Publishing, and Advertising Industries," August 1984, p. 16. While neither Berne nor UCC are mentioned, the CBS report calls for greater attention by GATT on copyright infringement, p. 2. See also our discussion of trade issues in Section I, supra.

[21] citing the Register of Copyrights, David Ladd, statement on April 20, 1982 that he was not interested in pursuing a protocol on this subject.

From a general perspective, former Register of Copyrights, Barbara Ringer, has said that Berne embodies a whole range of ideals for international copyright that, to her disappointment, United States law is still a long way from accepting.[23] And Stephen Stewart, the widely recognized British international copyright authority, and author of a principal treatise on the subject, predicted in his 1980 address to the Copyright Society of the United States that since there were no longer serious legal impediments to U.S. ratification of Berne, it would do so in the 1980's.[24]

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[22] Memorandum, MPAA to Harvey Winter, Executive Secretary of the Advisory Committee and Director of the State Department's Office of Business Affairs, Nov. 2, 1984. Also RIAA, op. cit., Oct. 15, 1984.

[23] Barbara Ringer, "United States of America," in Stewart, op cit, Ch. 21, p. 48.

[24] "International Copyright in the 1980's", Bulletin of the Copyright Society of the USA, Vol. 28, 1980-81, p.373. And Stewart, op cit.

II.3 The Universal Copyright Convention, (September 6, 1952).

There are 74 signatories to the UCC, including the U.S. The original Convention was very general, requiring only compliance with a minimum period of protection and "adequate and effective protection" in national laws, but no guidelines. The Paris 1971 revision was more specific, adding public performance and broadcasting rights, provided these are a part of national law. However, Article IV bis 2 has an escape clause, providing that domestic legislation may make exceptions that do not conflict with the spirit of the Convention. The Convention allows minimal registration formalities like those in U.S. law, provided that the notice of copyright is the sole formality that is applied as a condition of the existence of copyright protection. There are no moral rights provisions.[25] Also, the UCC, like Berne, does not protect neighboring rights.

According to Arpad Bogsch, in the principal commentary on the UCC, the "adequate and effective" clause makes the value of the Convention depend almost entirely on the level which copyright protection attains, according to national law, in the country where protection is sought.[26] That is, there are virtually no requirements from which there are no exceptions.

Bogsch identifies the reproduction, public performance, adaptation and recording rights recognized by UCC as accepted in all "civilized" countries. The question then becomes how do countries implement these rights. Without specific guidance, the answer is, with some wide variation in national laws and no sure guidance in borderline cases.[27]

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[25] See R.F. Whale and Jeremy J. Phillips, Whale on Copyright, ESC Publishing Ltd., Oxford, 1983, pp. 191-193.

[26] Arpad Bogsch, The Law of Copyright Under the UCC, Rev. 3rd Ed., R.R. Bowker Co., NY, 1968.

On the other hand, Bogsch argues, the vague language is more adaptable to changing standards than perhaps might otherwise be the case. The Convention can automatically keep itself modern. As soon as a new application of technology to creativity is enacted in the law of member countries, it is recognized by the Convention.[28] This possibly is an advantage of UCC over Berne.

II.4 The Convention for the Protection of Performers, Producers, and Broadcasting Organizations (Rome, May 18, 1964).

There are 12 signatories to Rome, a convention which protects neighboring rights. The U.S. is not a Member. Because Berne and UCC do not protect neighboring rights, several Conventions address particular protections for certain types of such rights. Rome was the first of to be adopted. Although it protects performers (original creators), Rome's focus is on protecting producers of phonograms (exclusively aural fixation of sounds of a performance or other sounds);[29] broadcasters (transmitters by wireless means for public reception of sounds and images);[30] and rebroadcasters (simultaneous broadcasting by one broadcasting organization of the broadcast of another broadcasting organization.[31] It also sets out the relationships between performers and producers by resorting to national law of the members.

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[27] Bogsch, op cit, p.6.

[28] id. The Acting U.S. Register of Copyrights disagrees, stating that "Berne is no less flexible than UCC ... with respect to the broadening of subject matter protection and exclusive rights" (Letter to OTA from Donald Curran, Feb. 22, 1985).

[29] Art. 3(b)

[30] Art. 3(f)

The U.S. has not adhered to Rome for both economic and other reasons of self-interest. The Convention itself is detailed and difficult to implement, partly because of its concern with complex technologies, and partly because of the conflicting economic demands of the various beneficiaries of the convention's protection. The Rome Convention has had difficulting gaining acceptance in many countries since it conflicts with the Berne and UCC protections of authors, whose interests, virtually axiomatically, are competitive with those of producers.[32]

The Copyright Office contends that "it is, in the long term, of considerable interest to the United States copyright-exporting industries whether other nations accept the Rome Convention or move otherwise to protect sound recordings." Consequently, the U.S. has a continuing concern about the growth of Rome and the acceptance in national law of the principals of Rome. It also views Rome as a means of assessing how to respond to challenges by performers that their livelihoods are being affected by new technology.[33]

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[31] Art 3(g)

[32] Copyright Office, op cit, p. 53.

[33] Id

II.5 The Convention for the Protection of Producers of Phonograms Against Unauthorized Duplication of Their Phonograms (Geneva, Oct. 29, 1971).

This Phonogram Convention has been ratified or acceded to by 32 nations, including the U.S. It is intended to solve a specific problem--piracy of records and tapes. The likely coverage of this concern in the Rome Convention is not useful because Rome has so few signatories. Also, Rome requires adherence to the UCC or Berne as a condition precedent to membership. Most of the States permitting piracy, however, do not belong to these Conventions.[34]

The Convention treats recording as a product of skill and labor akin to creation of original works and gives the record producer the right to allow or forbid the duplication of his phonograms, as a neighboring right. Article 2 provides further that Contracting States are required to protect record and tape producers of other Contracting States against making of duplicates without the producer's consent, and to protect against the importation and distribution of such duplicates to the public. Although the Convention generally relies on implementation through national law, it is not based on national treatment. Rather, it is aimed exclusively at the protection of foreign sound recording producers.

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[34] For a general background on the subject and economics of phonograms, see Davis, Gillian, "Piracy of Phonograms," EC, 2d ed., 1984; Davis, G., "The Private Copying of Sound and Audio-Visual Recordings," EC, 1983, SG. Culture 39/83; and "WIPO Worldwide Forum on the Piracy of Sound and Audiovisual Recordings," WIPO, Geneva, March 25-26 1981. Also see IFPI in Section IV, and on references on piracy in Sect. III.3 infra.

Although the Phonogram Convention attacks piracy, a key concern of copyright, it is not, according to some commentators, really an intellectual property convention.[35] That is, its remedies are drawn from other legal schemes, including criminal penalties and the law of unfair competition. Use of noncopyright-type international remedies in general, and whether or not this Convention is realizing its goal of combatting piracy, is discussed under piracy in section III.3 infra.

The general importance of this Convention to U.S. international copyright policy has been described by the Copyright Office:

> "In assessing the record, it is appropriate to consider the overall place of the Geneva Phonograms Convention in the legal structure of United States sound recording abroad. The United States is a member of the Convention and it has been accepted in states where the recognition of copyright or neighboring rights is already secure, at least de jure. There are, even in these states, advantages to United States sound recording interests arising out of the adherence of industrialized states in the Phonograms Convention. Because not all states party to the UCC appear to be in accord on the question of whether the UCC may serve as the basis of eligibility for protections of phonograms and the United States is not a member of the Rome Convention, membership in the Phonograms Convention has the effect of settling the question of our rightsholders' entitlement to protection of their sound recordings in some very important markets."[36]

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[35] Copyright Office, op. cit, p.56

[36] op. cit., p. 57

II.5 The Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite. (Brussels Satellite Convention, 1974)

There are now 8 signatories to the Brussels Convention, including the United States. Unlike most copyright conventions which deal with private rights, Brussels is a public international law treaty. Technically, it protects radio signals, not creative works, from piracy, and confers no private rights on anyone. Of course, in protecting the signals from illicit distribution it also protects the programs carried on the signals, but not the rights of copyright holders in those programs.

The conceptual problem the Convention is designed to resolve, according to Stewart,[37] arises in that most programs transmitted by satellite are not derivative because the original work is not copyrightable. Hence, the progams are not subject to neighboring rights protection. For example, most often satellites are used to transmit sports events and news items of some immediacy. Of course, this may change over time as there is more international exchange of films and video-generated materials. In the U.S., where prerecorded programming forms a major component of satellite distribution, this change is already occurring.

Misappropriation of these signals, at least initially, was not considered within the scope of copyright. Under the Brussels Convention, however, by protecting the emission of the signal, all types of transmitted programs have some protection, with no questions asked about who has various rights to pre-existing works. Owners of these specific rights must look for protection elsewhere.[38]

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[37] op cit.

There also have been arguments about which part of the satellite transmission should be protected as a broadcast -- that is, as a transmission to the general public -- because concern does not extend to private use in this situation. Some argue that the upleg is not broadcasting but rather a technical aspect of telecommunications regulation, and therefore not the object of intellectual property rights. The argument follows that the transport of signals to the satellite is not intended for direct reception to the general public, but that the receiving organization, on the down-leg, determines whether and where the signal will be distributed.[39]

A wider view of broadcasting is that the satellite transmission is one transaction, with the sender assuming that the signal will be transmitted to the public after some sort of terrestrial decoding process. This view has prevailed among the signatories of the Convention on the basis that the purpose sought and achieved by the originating organization is what matters.[40]

An important limitation of the Brussels Convention is that it covers distribution of program-carrying signals transmitted only by point-to-point and distribution satellites. It may not cover direct broadcasting satellites. These may either be protected by the Rome Convention or have no international protection at all. The intention is unclear. This would be a particularly crippling limitation since it would not recognize the ability for interception by private satellite dishes, even in cases where the satellite transponder's footprint was not intended for the area where it is being intercepted.

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[38] id, p. 251.

[39] Id, p. 252.

[40] Id.

When the Convention was written, it was not generally expected that electronics would advance so rapidly that earth stations would become available to the general (albeit a fairly affluent) public which could pick up signals not intended for small dishes, or that microwave amplifiers would so drop in cost that weak signals from sidelobes could be received by ordinary users.[41] Today, unofficial direct reception of satellite signals is prevalent in many regions where only the visibility of the satellite from the ground is a technical consideration.

The Brussels Convention takes a similar approach as the Phonogram Convention in requiring protection of a signal originating in a foreign country, regardless of treatment of domestic signals in national law. The signal is protected during the upleg, satellite and downleg portions of transmission, but not for unauthorized distributions of a satellite derived signal subsequent to its first authorized terrestrial distribution. The Convention allows each state to choose its own method of implementation including the specific beneficiaries of protection.[42] It defines a wrong and leaves it to each Party State to use its discretion in righting the wrong.

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[41] This is discussed in more detail in Section II.4.2, including some technical methods of protection for future systems. Most television and audio satellite signals are not encrypted, and mere scrambling of scanning lines or frequency bands is not sufficient to prevent such access by determined users. See K. Miya, Satellite Communications Technology, KDD Engineering & Consulting, Tokyo, 1983, sect. 1.6; Jansky, Donald M., World Atlas of Satellites, Artech, 1983, chapter 6; and "Records of the Brussels Satellite Convention," UNESCO, 1971.

There are certain allowances made, at the discretion of Party States, for permitting otherwise unauthorized distribution of satellite signals within a Party State. Interestingly, these all relate to the content of the message transmitted, rather than to the signal, such as fair use of quotations, short excerpts of news programs, and valid educational uses within developing countries. On the one hand, commercial interests in the U.S. have objected to this provision as eroding copyright protections, and the educational community has complained that it does not provide enough access, particularly for classroom use.[43]

Although DBS is currently more viable in Europe than in the United States, it may be necessary to focus on specific protections for DBS in the future, although according to the Copyright Office report they are probably protected under existing Conventions.[44] Developing countries, and the EC Television Green paper are discussed in Section III, infra.

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[42] Id. The International Telecommunication Union's International Radio Consultative Committee is currently studying digital coding of television signals for satellite broadcasting. See CCIR Report 629-1 and CCIR Recommendation 601 (1982). Also International Networks, October 1984, pp. 2-3; and Solomon op cit.

[43] Copyright Office, op cit, p. 64. [44] id, p.62.

III. Significant Concerns

There are many substantive concerns regarding international protection of and international access to intellectual property. We have chosen five topics to address, which have a wide range of ramifications for U.S. international intellectual property policy, and for future copyright solutions. These are discussed in the following sections:

III.1 protection of computer-related creations
III.2 compulsory licensing and collection societies
III.3 piracy
III.4 satellite and cable signals
III.5 the problems of developing countries

III.1 Computer-Related Creations

We will examine three significant categories in need of protection: 1) software or programs; 2) data bases; and, 3) microchips (or rather, logical microcircuits). The legal and technical issues relating to each are different, and some have argued that they should be subject to different sorts of protections. [1]

Several fora concerned with international copyright have been vigorously debating computer-related intellectual property issues. UNESCO and WIPO have been holding joint meetings of experts since the summer of 1982. (The next UNESCO/WIPO expert meeting is scheduled for the last week of Feb., 1985.)[2] Much confusion has arisen over the mere definition of such things as databases, thesauri, data dictionaries, "performance," and reproduction, and there does not seem to be any ready resolution of these problems. OECD's ICCP committees are also struggling with these matters with the next meeting scheduled for this spring.[3]

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[1] The technical aspects of each are extremely complex and only a general introduction to the technology from an international viewpoint is discussed in this paper, as we noted in the introduction. For more details, see Solomon, (OTA, 1984), op cit. and Section I, footnote 2, infra.

Even within jurisdictions there is no agreement. Japan is a particular revealing case (section III.1.2.2). Recently the French Parliament decided to hold back on revising their copyright laws to address the computer issue in order to further study these complicated questions. The trends in France currently are to categorize the different types of software to determine what range and types of protection should be provided.[4] The EC Information Technologies task force, which is sponsoring the TRANSDOC electronic publishing experiment,[5] is concerned that existing legislation does not cover the innovative technologies which are expected to emanate from their experiments. Because there are competing interests with substantial economic and political power at stake, it will likely be difficult to reach agreement in the near term.

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[2] See reports from the "Second Committee of Governmental Experts on Copyright Problems Arising from the Use of Computers for Access to or the Creation of Works, 3 May 1982 to date: UNESCO/-WIPO/CEGO/II/series. Summaries are also in issues of UNESCO's Copyright Bulletin.

[3] OECD, "Copyright Law...", op cit.

[4] Interview with Mme. Pitrat, Mission a l'Informatique, Paris, Dec 1984.

[5] See International Networks, December 1984, pp.5-7, and Section III.1.1.3 infra.

III.1.1 Computer Software. In the United States, computer software is protected under the 1980 Copyright Act, (17 USC Sec. 102). A similar approach, either statutory or court opinion, is followed in some countries that protect software. The issue regarding international protection is whether Berne and the UCC protect software or, indeed, if they do, whether they offer the most appropriate protection available.

Most of the members of either Berne or the UCC consider that these conventions cover computer programs, and that copyright is the most suitable form of protection. But this does not mean that copyright protection is totally effective, or that other, more effective, systems could not be devised.[5a] Reliance on these conventions may have been the path of least resistance. The Report of the British Whitford Committee on Copyright and Design Law, for example, suggests that nations should rely on these conventions as far as possible to because it would be very difficult to prepare a new international treaty focusing exclusively on computer software.[6]

[5a] The Acting Register states that "since January 1984, the Dept. of Commerce and apparently the USTR's Office and the Dept. of State have posed another issue [in international copyright negotiations]: Is protection for computer software now mandatory under Berne and the UCC; i.e. is it a violation of the copyright conventions for a party thereto to protect computer software under laws other than copyright or to refuse to protect software at all?" (Letter to OTA, op cit). This may be begging the question if the meaning of software protection under different interpretations cannot be resolved.

The general view is that both Conventions do encompass computer software because such software is in human readable form, at least in its production and testing stages.[7] But it should be recognized that this is an evolving view, and that much software is quite unreadable by humans -- including the humans who may have written it -- even when the instructions are displayed or printed in source code. Computer-aided design (CAD) systems are becoming essential for complex circuit design, among other examples, for no human can keep track of the complicated syntax, algorithms, and databases needed in advanced engineering.[8] Eventually, the "human readable" rubric will have to be replaced with something else permitting the legal protection of computer-related work. If some nations take a different view on this than the U.S., international copyright conventions may not be sufficient to protect U.S. software.

III.1.1.1 Functional Works.

An increasingly important issue is whether Convention limitations on protection for artistic, literary, scientific and technical works are intended to apply to functional works such as are embedded in some computer programs. An example is the type of software used to generate microcircuits which themselves maybe intended to perform machinelike functions according to mathematical algorithms.[8a]

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[6] London, March 1977, HMSO, Cmnd 6732, para. 292 and 570.

[7] Manfred Kindermann, "Computer Software and Copyright Conventions," European Intellectual Property Review, vol 1, 1981, p. 6.

[8] See for example the discussions of CAD in VLSI design in Anceau, F. and E. J. Aas, eds., VLSI Design of Digital Systems, North-Holland, 1983, pp. 387-433.

In addition, the nature of computer programs is such that several of the minimum requirements of either or both of the Conventions may not offer appropriate protection.

III.1.1.2 Publication.

Both Conventions protect published works differently from unpublished ones. The significance of this is that, with computer-based materials, it is frequently difficult to establish publication as defined in either Convention. The Conventions appear to require a printout or other form of human readable copy in order to establish protection. "Transmission of the contents of the package to the licensee via telecommunication lines or by wireless transmission would, however, not establish a publication, unless a printout of the contents received is produced on the premises of the customer."[9] In addition, it is relatively easy to "publish" computer-transmitted works without the knowledge or the consent of the originator.[10] Furthermore, some computer material, such as programs written by other programs, or databases generated by programs, never need to be printed or even seen by humans.[11] From the international point of view, such software may be generated in one country and transmitted to another for use on a different machine without any human intervention or knowledge. The protection offered these works is unclear under any of the Convention premises which require publication.

[8a] This is discussed in more detail in Sect. III.1.3 infra; also see Solomon (OTA, 1984) op. cit.

[9] Kindermann, op cit.

Berne protects unpublished works only if authors are nationals of, or have their habitual residence in, one of the member countries of the Convention.[12] The UCC protects unpublished works only if created by a national of a member state.[13] Both Conventions protect the works of authors published in a member state even though the authors are not nationals of a member state.[14] Computer-based materials would, for the most part, acquire only the lesser protection of unpublished works. In addition, if they are printed out in a non-Convention jurisdiction it could be difficult to establish the originator's rights even if the work were created within a Convention member country. This loophole provides computer-based materials a lesser degree of protection than other forms of copyrightable work protected under the Conventions. Because of the growth of computer networks and the ease a software writer now has in continually changing work venue during the act of creation,this category of material should have more, rather than less, protection. Works created jointly by teams working online in different countries adds further confusion to this problem.

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[10] See Pool & Solomon, "Intellectual Property and Transborder Data Flows," Stanford Journal of International Law, Vol. 16, Summer 1980, p.124ff for a description of publishing which is not publishing. The legal definition of "publishing," as explained in the cited paper has no relevance or meaning on electronic networks; an issue which is expected to cause great problems in the future for numerous areas where published materials have a specified legal and physical presence.

See also Solomon, (OTA, 1984) op cit, on electronic publishing. And the TRANSDOC experiment, footnote 5, supra.

[11] Shrobe, H. E., "AI meets CAD," in Anceau, op cit, pp. 387-400.

[12] Art. 3(1a), (2).

[13] Art. 11(2).

[14] Berne, Art. (3)(1); UCC, Art. 11(1).

III.1.1.3 Reproduction, Performance, Moral and Translation Rights

Each of these rights is recognized at some level by both Berne and the UCC with respect to works protected by copyright in general. The *droit morale*, although not a specific provision of the UCC, must be respected under Article V.[15] As far as software may be covered by these Conventions, these rights should apply to it also. However, because of the complexity of software and computer systems used in the production, distribution, and delivery of computer-related materials, it is not clear how these protections actually would apply in practice.

Some commentators insist on calling the display of textual material on cathode-ray tube computer terminals "projection", an analogy to film; but this is a misnomer, for CRT displays essentially use computer logic to regenerate each and every dot which construct the characters or graphics. It is neither a "performance" nor a printed reproduction, but something novel entirely. That it is transitory is only a coincidence on a very short portion of the technological timeline. Some devices, such as liquid crystals, may hold displays for long periods of time. Other devices have been devised which are a hybrid between paper and a temporary display. More important, the data which created the display may remain in the machine's memory structure until willfully erased.[16]

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[15] See Stewart, op cit, p.153; and our discussion in Section II.1.2 supra, on moral rights and its potential implication for modifications and use of computer software.

More complex problems occur if a program is caused (either by the program itself, or a control program such as in an operating system, or via a third party program) to display its output in numerous locations simultaneously. Since computer data are not at all like film information, again it is futile to address these instances as performances and pretend that performers' rights can be observed. Because of the digital nature of the information creating the display (or print), making multiple and simultaneous reproductions or displays are trivial tasks. No matter what legal rules are written, or software provided for display, the ultimate display can be totally under the control of the user, not the creator. Display and printing may be technically reproductions, but like local reprography, attempting to control this from the origination point, or by the creator of the intellectual work, is futile.[17]

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[16] See Solomon, (OTA, 1984) op cit, for additional references.

III.1.1.4 Translation rights are similarly bogged down in terminology which attempts to find analogies to older ways of thinking about copyright. Artificial Intelligence techniques, and CAD/CAM methodology are making such interpretations as the compiling of object code from source code a "translation" look ridiculous. How, for example, would copyright treat the output of a machine which would translate spoken Japanese into spoken (or written) English as part of an online telephone call? This is one of the goals of the Japanese Fifth Generation computer project and Nippon Telephone and Telegraph has indicated that they expect to offer such an online service within a decade.[18] Furthermore, silicon compilers (see Sect. III.1.3 infra) take data from one source and literally manufacture novel VLSI chips. Is this a "translation" because a computer compiler is involved? What if a "translation" creates a functional device from "literary" databases? Can such be copyrighted? What rights does a creator of such works have under the copyright Conventions?

III.1.1.5 Data Bases. A computerized data base is a novel form of intellectual property quite unlike data contained in paper files and file drawers. Databases stored on random-access high-capacity disks, perhaps distributed over many computer sites around the world, are not like data stored sequentially on punched cards or reels of tape. Modern computers do not need a perfectly ordered set of records and files, but can search out information based on complex relationships.[19]

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[17] Ibid, for further elaboration on these vital points.

[18] Japan High Tech Review, November, 1984

Furthermore, a computerized data base assumes a data base management system or a data query system which manages the algorithms of search and retrieval, and which may be subject itself to separate copyright. The relationship between DBMS and data bases can be extremely complex, especially on a distributed data communications network where many parties may be owners or users of controlling software. Interfacing to very large databases could become an issue of standards in order for certain types of data query systems to work. For example, even though a database may not be an uniformly ordered compilation, some internally-controlled pattern will have to be followed, even if only to avoid confusing a human user who may access numerous databases.[20] This is all complicated further in the international context because of the transborder issues.[21]

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[19] See Winston, Patrick Artificial Intelligence, Addison-Wesley, 1977, chapter 4, for a discussion of advanced methods of searching and using data bases; a number of conferences on the access to "very large data bases" have been held in the past decade discussing novel methods and quite radical conceptions of what a data base may be; see, for example, the 8th International Conference on Very Large Data Bases, Mexico City, Sept, 1982. Also Curry & Mukhopadhyay, "Realization of Efficient Non-Numeric Operations through VLSI," in Anceau, op cit.

[20] Mexico City conference, op cit, pp. 12ff. Also The World Videotex Report, Online, London, 1984, pp. 241ff.

The term "database", may apply to several different kinds of "compilations" (see below for definitions). A computer databank may include not only textual materials and abstracts of text but also "non-literary" matter such as statistics or raw data about physical relationships, materials, algorithms, and other things which themselves may not be copyrightable. Statistical online databases may not permit direct user access to the raw data, but only to such things as aggregates, averages and profiles. However, statistical databases can be compromised indirectly by mathematical attack, despite attempts by creators not to let all the data out, or to control information flow.[22]

The definition of databases gets quite confusing when it is consider that databases are an inherent part of the design software in VLSI manufacturing (Sect. III.1.3). Furthermore, databases, or compilations, are the way list-processing high-level computer languages work, such as LISP.[23] Are these all to gain the same type and level of protection or non-protection under the copyright conventions?

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[21] See UNESCO/WIPO/SEGO/II/7, 13 Aug. 1982; Pool & Solomon, op cit.; and OECD, "Computer Law...", op cit, p 10, which notes that the protection of databases remains "unclear."

[22] Denning, Dorothy, "A Review of Research on Statistical Data Base Security," and DeMillo, Richard et al, "Combinatorial Inference," in DeMillo, ed., Foundations of Secure Computation, Academic Press, 1978. Even lying can be detected. Also Turn, Rein, ed., Advances in Computer System Security, Artech, 1982, section 4 on database security.

[23] Winston, op cit., chapter 11. Furthermore the legal definition of "compilation," and the computer science definition of "compiler" often are confused with that of a compiled database.

III.1.1.5.1 Compilations.

One interpretation of a computer database is that it is a mere "compilation". Berne and UCC do protect compilations to the extent that they are protected under national law. Many countries, including the United States,[24] grant such protection. Although certain types of data bases, in particular some online information services, are akin to compilations, they are more difficult to protect than a hard cover compilation. This is because "they are rarely reproduced. Rather, selected pieces of information are extracted for reproduction or utilized electronically by another computer."[25] As the latter problem grows -- computer-to-computer information retrieval -- it will be particularly difficult to protect against unauthorized appropriation and reproduction of intellectual property. AI programs have been written which take material from different online databases and use this data to make inferences or create novel outputs, sometimes without the source data ever being presented in any human-readable form. Should such material be used over and over again, it is not clear what protections any of the international conventions offer the original creator of the compilation.[26] Such inference machines are an essential part of the Fifth Generation computer research efforts around the world.

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[24] 17 USC sec. 103.

[25] Carol S. Blumenthal, "Electronic Technologies and Protection of Intellectual Property," in Yurow, Jane, Ed., Issues in International Telecommunications Policy: A Sourcebook, George Washington University, September 1983, p. 220.

[26] Solomon, (OTA, 1984), op cit.

III.1.1.5.2 Literary or textual databases.

The American Bar Association Committee which recently considered the issue of the application of Berne and the UCC to the transmission of literary works in data base form stated that the collection of royalties from foreign sources with access to electronic online databases would be difficult. It suggested that it would be more practical to enforce royalty payments by collecting these at the source, e.g. from libraries and other transmitters, and to authorize them to pass the obligation on to the recipient party in the foreign country by charging a fee for the transmission.[27] Of course, the ABA Committee is referring to an archaic method of accessing databases, whereby some user travels to a central location to collect information, or receives it by mail from a foreign country. The systems, as noted elsewhere, are moving away from such retrieval to direct data access at one's office or home terminal.[28]

More to the point for documentary and bibliographic compilations of literary reference materials, indices to these compilations, and thesauri, are the following questions:

"What will be the database 'publication date' to be taken into account in calculating the protection period? This is a question that is difficult to resolve if one considers that any data base is constantly being updated.

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[27] Section on Patent, Trademark and Copyright Law, ABA Committee Reports, 1983, op cit. p. 137.

[28] Solomon, op cit.; and Solomon, Richard Jay, "International Access to Medical Data Bases," in Branscomb, Anne, Toward A Law of Global Communications Networks, 1985 (in press), Longman (based on an OTA 1982 report).

"How can one resolve the frequent cases of overlaps in data bases or will it be possible to protect the same references or sets of references in different data bases?

"How would one treat two independently created data bases which, due to the standardization of formats and of rules in drawing up the catalogue, prove to be almost identical?

"How can one satisfy the requirements of deposit of copies in the event of laws containing administrative rules to ensure protection?

"What arguments could be used to show an act of plagiarism?"[29]

III.1.2 National software laws.

The weak link in using Berne and the UCC to protect software (to the extent that it is technically possible to do so) is that while Member countries generally consider software eligible for copyright protection, the Conventions leave the manner of its protection up to each country's law. We have noted that most advanced industrialized countries consider software to be copyrightable. These include the U.S., United Kingdom, Federal Republic of Germany, Italy, Australia, Austria, France, Hungary, and Norway which protect software either by statute or by clear judicial decision. Other countries like Canada and Japan (infra) are undecided on the question, or are engaged in a debate. However, definitions are likely to vary widely as some of the more intricate questions posed above come before national courts. Without some international guidance, we can expect other political and economic pressures to play a role in defining what can and cannot be protected. For example:

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[29] From Milagros del Corral Beltran, "Data Bases and Intellectual Property," Copyright Bulletin, UNESCO, No. 4, 1983, p. 12.

III.1.2.1 Brazil.

Brazil is proposing a registration scheme for computer programs as a necessary condition to asserting any claim to exploit programs. It would require that overseas owners must establish ownership through an exclusive representative in Brazil. The Bill further requires that in a national emergency, as decreed by the government, the producer would be required to grant third parties the right to reproduce the software. Finally, it would require that the software be actively used in order to remain registered.[29]

This proposal has been heavily criticized, among other reasons because it conflicts with UCC provisions, assuming that the UCC does cover software. Brazil is a member of the UCC.[29a]

III.1.2.2 Japan.

Japanese court decisions have held that computer software is protected under copyright. [30] However, the Japanese are actively debating alternatives to protecting software including a patent-oriented compulsory license scheme. (We have noted MITI's objections to droit morale, supra.) Though severely criticized in the U.S. trade press, the Japanese debates on the "issues are not frivolous nor have they been adequately debated in the United States or in other countries that generally apply copyright law to computer softwar."[31] No doubt, due to MITI's close ties to the Fifth Generation computer project, MITI recognized that the drastic changes which software will undergo as AI techniques are applied will have a major impact on software protection. It probably is an unfair representation that MITI's proposals are disingenious statements meant to "steal U.S. software". MITI apparently was startled to learn that the rest of the world misinterpreted their proposals, and have withdrawn some of the more objectionable points such as compulsory licensing "due to concern that foreigners would seize upon it and ignore the rest of the bill's contents."[32] MITI will probably not introduce a bill which will be adamantly opposed by U.S. interests, but they still feel that some rewrite of the law is essential.[33]

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[29] A Bill Regulating the Exercise of Rights Over Computer Programmes and Pertaining Dispositions. An Informal Translation. Embassy of Brazil, Canberra, April 1984.

[29a] Furthermore, the U.S. has raised questions about whether the UCC mandates coverage of software. But see footnote 5a, supra.

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[30] Taita, Inc. v. I.N.G. Enterprises, Inc. Dec. 8, 1982, Tokyo District Court. See also Davis, et. al, "Legal Protection of Computer Software in Japan," Computer Law Rep., vol 1., pp 559ff (1983) for an earlier discussion.

[31] Karjala, Dennis S., "Lessons from the Computer Software Protection Debate in Japan," Arizona State Law Journal, 1984, pp. 53-82, at 56. A review of the debate, issues and sources for further research on the Japanese questions.

One of the problems in analyzing the Japanese discussions on the merits of protecting software has been internal Japanese jockeying for power:

> "underneath this substantive debate ... lurks a jurisdictional dispute. Copyright law in Japan is administered by the Cultural Affairs Agency (CAA) under the Ministry of Education, which is a relatively weak ministry.... With the growing recognition of the computer software industry's economic importance, it seems natural that governmental regulatory authority should reside in MITI rather than the Ministry of Education. In fact, so powerful is MITI that, were Japan wholly free from external influence in the matter, one could be fairly confident that MITI would win the jurisdictional battle. A significant boost to CAA's position, however, comes from the worldwide trend to base computer software protection primarily on copyright law and the international network of protection that copyright law provides."[34]

While both MITI's and the CAA's reports recognize many of the problems discussed in this paper in terms of computer-related intellectual works, the CAA feels that the existing law can handle the problems, while in general MITI wants a new law which applies only to computer software.[35] MITI's main differences with present Japanese copyright law cover: 1) establishing a right of use for the program developer, primarily to cover undue reproduction; 2) establishing a right of rental for the user; 3) not to provide for moral rights (even though Japan is a signatory of Berne); 4) a procedure for settling disputes using technical experts without making source code public in court; 5) changing the duration of rights (but not without international agreement to make them much shorter); and 6) provision for registration to clarify rights, but as a voluntary measure.[36]

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[32] Japan High Tech Review, October 1984, p. 5. Oddly, it has been pointed out that "mandatory licensing has existed for years in Japanese patent law; thus MITI expected that aspect of the proposed bill to be accepted without protest." id. Furthermore, any reading of Japanese efforts in the Fifth Generation project indicates that the Japanese intend to lead the world in advanced software and utilization of innovative databases [See for example, Aiso, Hideo, "VLSI Technology for Next Generation Computers," in 1983 Symposium on VLSI Technology, Japan Society of Applied Physics, p. 6; JIPDEC Report, op cit.]. It is hard to understand why Japanese industry would want to lessen protections in that case.

[33] Japan High Tech Review, op cit. [As this paper is being revised, the bill has been withdrawn, and a bill more agreeable to the U.S. is supposed to pass this spring.)

[34] Karjala, op cit,p. 54.

The CAA recently issued a new report on database rights which asks the copyright law to be applied directly to databases, but with some definitions as to what is to be covered. A database was "defined as an 'integrated work,' while it formerly was considered an edited work... As a result [the existing law permits] a data base publisher [to] claim copyright for a part of its data base..."[37]

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[35] See Japanese Information Industry Committee, Interim Report, op cit; "Response to Interim Report," CAA's critique, Feb 7, 1984; and "Interim Report of the Copyright Council, the Sixth Sub-Committee for Computer Software," January 1984.

[36] JHTR, November, 1984, p. 5.

[37] The Japan Economic Journal, December 25, 1984, p. 1.

III.1.2.3 WIPO Model Software Bill.

In 1978 the International Bureau of WIPO prepared Model Provisions on the Protection of Computer Software as guidance to countries drafting computer software legislation. These were in lieu of suggested treaty language which the Bureau considered to be premature in view of the fact that most countries had not yet determined a statutory scheme for protecting software.[38] The provisions of the model law are heavily copyright-oriented, but recognize that resort to patent or unfair competition law for some aspects of computer software protection might be necessary.[39]

III.1.3 Semiconductor Chips.

The United States is the only country that has enacted explicit legislation protecting semiconductor chips. The Semiconductor Chip Protection Act of 1984[40] establishes a sui generis scheme for protecting semiconductor chips from piracy. The Senate Report found that chips are utilitarian articles which are not generally protected by copyright.[41] Patent protection was also found inadequte because "it does not protect the carefully developed layouts and artwork required to adapt circuitry for a particular industrial purpose in the most economical and efficient way."[42] The report discards trade secret protection because the secrecy of the chip layout is dissipated once the chips go on sale.[43]

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[38] WIPO, Model Provisions on Computer Software, Geneva, 1958, p.4

[39] Id, Sec.9

[40] 17 USC, Sec. 90. Japan is considering a chip protection bill similar to the U.S. version [The Japan Economic Journal, January 1985].

[41] Senate Report 98-425, 98th Cong., 2nd Sess., May 2, 1984.

The House Committee found that chips might not qualify for protection under UCC for a variety of reasons stated in its report.[44] Furthermore, since no other country has protected mask works under the UCC there is no assurance that there would be general agreement with the U.S. that a chip can be protected under copyright. This could lead to a situation where the U.S. was obliged to protect the chips of other UCC countries with no corresponding obligation. The U.S. could, for example be required to protect mask works of Japan, West Germany and the Soviet Union, and receive no protection in return.[45]

The Act contains provisions granting reciprocity to any country that protects semiconductor chips in a manner equivalent to U.S. protection and allows such country to secure full protection under the Act. This may provide incentives to foreign countries to enact similar legislation or encourage development of a treaty on chips. The Act contains a compulsory registration provision because Congress considered this necessary to create greater certainty of rights for mask work owners and the public.[46] This is more stringent than the voluntary registration provision[46a] in the Copyright Act and represents a step in the opposite direction from a widely held international viewpoint that opposes registration of intellectual property, at least in the context of copyright.

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[42] op cit, p.8.

[43] op cit, p.9.

[44] House Report 98-781, May 15, 1984, p.7

[45] id.

Section 914 of the Act permits the Secretary of Commerce to permit registration that would extend protection for up to three years to foreign nationals, domiciliaries and sovereign authorities if the Secretary finds that the nation is making good faith efforts and reasonable progress toward entering into a treaty to establish reciprocal protection for semiconductor chips or is enacting legislation that would make reciprocal arrange ments possible. This is further conditioned on a finding that the nationals and domiciliaries are not misappropriating, distributing, or exploiting mask works commercially. Once this is established, the Secretary must still find that isssuing the order would promote the purposes of the statute and international comity with respect to mask works. One commentary describes this as "a sizeable carrot to encourage the Japanese--among others--to bring their legal system into line with the new U.S. law."[47]

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[46] op cit, p. 24.

[46a] However, 17 USC 407 contains deposit requirements for works published with the notice of copyright.

[47] Cary H. Sherman and Hamish R.Sandison, "Chip Protection Bill Adopts Sui Generis Approach," Legal Times, December 10, 1984, p. 11. This may be the reason Japan has introduced such a bill.

However the Act has a large loophole and ignores several important details about the trends in chip manufacturing for Very Large Scale Integration (VLSI). The Act permits "reverse engineering"[48] where it can be shown that sufficient care was taken to understand the chip process. With AI techniques for the design of chips coming on stream rapidly using Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM), reverse engineering itself can be automated.[49] The other loophole is an assumption that chip piracy will always take place by merely photocopying the chip designs by slicing open the chip. This is curious, since the bill does recognize that VLSI is moving away from photolithography to other techniques which are closer to integrated software manufacturing.[50] It is not clear that the Act will protect such designs -- normally protected by trade secret actions -- and it may even weaken what protection these chips formerly had, if any, under the Copyright Act due to conflicting national definitions of software, compilations, compiling, and chips.

Software for automated chip manufacturing is essentially a DBMS which accesses a set of specialized statistical and materials databases. Many rights questions will arise as the property issues in databases begin to conflict with patent and other protections for chip design[51]. The international implications are obvious, since no computer device can be successful if marketed only in one country, and the information for automated manufacture is likely to come from anywhere on a network in future design efforts[52].

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[48] sec. 906.

[49] See IEEE Spectrum, November 1983, pp 100ff, and June 1982, pp 38ff for discussion on the evolving technology of VLSI and automated chip production. Also Anceau, op cit, chapters on CAD for VLSI; 1983 Symposium, op cit., passim; and Appleton, "Computer Integrated Manufacturing," Datamation, Dec 15, 1984, pp. 66ff.

[50] id.

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[51] See Anceau, op cit, pp 37 and passim. Makoto Watanabe, 1983 VLSI Symposium, op cit, p. 3, discusses silicon foundaries acting "like that of publishing companies and printing companies. That is, end-users would claim all copyright as in the case of book publishing."

[52] OECD, "Software," op cit.

III.2 Compulsory Licenses and Collecting Societies.

The new technologies are characterized by elusive fixations and ready duplication and promulgation. Hence, a review of how the international treaties currently treat the role of collecting societies and licensing is presented here since it is often suggested that a possible technical solution to inhibit infringements may involve enhanced monitoring of the use of works.

III.2.1 Definition

A compulsory license reduces the absolute right of the copyright owner granted by both domestic law and copyright conventions to a right to equitable remuneration. It requires copyright owners to grant authorization to use their work without depriving them of their right to negotiate the terms of the authorization. This right is frequently limited by national laws requiring an administrative or judicial body to fix the amount of remuneration, particularly if no agreement can be reached.[53]

States provide for compulsory license where users of certain works need access to them, know the terms of access, but cannot locate the right owner each time to obtain an individual license. The compulsory license also avoids the creation of a monopoly for a user of certain copyrights at the expense of all others.[54] Although used in certain circumstances in moral right countries, the compulsory license concept conflicts with the idea that an author should have complete control over his work. In economic rights countries the compulsory license frequently poses the problem of lower remuneration to authors because they are deprived of their bargaining power.[55]

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[53] See Stewart, op cit, p. 71

[54] Id.

III.2.2 Berne

Berne contains two compulsory licensing provisions: for broadcasting[56] and recording[57]. Except for these situations, national law of Berne members may not authorize compulsory licenses. Where a license is established it must safeguard moral rights of authors, provide equitable remuneration fixed by a competent authority (probably the government); and apply only in the country which has provided for it in its law.

In addition, Berne provides for the option of compulsory licenses in LDCs, especially the licensing of print and translation rights under conditions set out in the convention. It is not clear what this will mean for various types of computer software.

III.2.3 UCC

The UCC is much more permissive, requiring only that Members provide effective protection of copyright in the areas enumerated in the Convention, with little guidance as to how to establish such protection. UCC also has a compulsory license provision similar to Berne relating to LDCs.

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[55] Id p.71. Note: The U.S. systems differs. There is a statutorily-created government Copyright Registration Tribunal which collects and distributes royalties for certain types of creative effort, e.g. cable TV, juke boxes, etc.

[56] Art.11 bis (2) [57] Art. 13(1)

III.2.4 Rome

Under Rome the broadcasting and public performance rights are subject to a kind of compulsory license as these rights are only in equitable remuneration, a concept akin to that granted by compulsory licensing. This pattern has been followed by many countries in their national laws.[58]

III.2.5 Technology related.

Judging by most recent revisions of copyright laws, there is a trend toward creating compulsory licences particularly in those fields where modern technology has created new uses for works the rights to which can only be exercised effectively by bulk licensing.[59] Satellite and cable distribution may demand voluntary or compulsory licensing, and many European countries, despite moral rights laws, already have this sort of system for collecting royalties.[60] Reliance on compulsory licensing, however, is generally a last resort used only when good faith negotiations fail to achieve a voluntary resolution.

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[58] Stewart, op cit, p. 72.

[59] Id p.74

[60] Whale, op cit, p.260

III.2.6 Collection Societies

Representation of copyright holders' rights is frequently handled by voluntary collecting societies which form what for many countries is a more palatable alternative to compulsory licensing. If some international system of monitoring the origination, distribution, and use of intellectual works related to the electronic media can be established, then the role of collecting societies may have to be merged with those of the international technical standards-making bodies and possibly the international communications carriers as well. This may cause numerous conflicts, because the collecting societies roles' have been different from the voluntary association of standards organizations, and the demands of the carriers.[60a]

Traditionally, collecting societies have been formed by those contributing to creation and production of various categories of copyrightable works to distribute royalties resulting from the distribution and reproduction of these works to the public. When authors allow themselves to be represented by a collecting society they may "give a hostage to their economic fortunes" because their works are subject to influences beyond their control, including the government. Frequently the government is involved either in setting the royalty rates or in arbitrating disputes when agreement cannot be reached voluntarily. This system works fairly well in countries like the U.S. and U.K. where authors, in general, are supported and honored by society. However, in many developing countries and copyright importing industrialized countries authors may not receive adequate protection from exercise of collective rights.[61]

[60a] See Solomon, (OTA, 1984) op cit for some suggestions on international standards for copyright protection and verification. The possibility any such system can be made to work has not even been theoretically established from a mathematical viewpoint. Therefore, any detailed discussion of conflicts between existing societies and organizations is premature. This section is offered so that technicians working on possible protection systems can understand the wider legal and social context.

Frequently one collecting society represents a particular industry such as music distribution, and all segments of that industry--authors, composers, and music publishers combine to assign their rights to a national association which possesses the national repertoire of music. The members often grant the association a license regarding the rights to repertoire of similar associations in other countries. In this way national collective societies join together to enhance the international distribution of music with some assurance that copyright owners in the various countries will be compensated.

CISAC, the International Confederation of Authors and Composers Societies in Paris, is an association to which national collecting societies belong. It lays down principles of good administration and cooperates with UNESCO and WIPO in assisting LDCs to stimulate the production of indigenous works through many means, including effective copyright protection.[62]

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[61] Whale, op. cit., p. 257-258

[62] Ibid. p. 263.

III.3 Piracy

It is difficult, absent a commitment on the part of governments to enforcement of anti-piracy measures, to control piracy. Copyright law measures, established at the national level, will be differentially enforced. Frequently these remedies are inadequate to the task at hand. Legal and law enforcement mechanisms outside of the sphere of intellectual property law are increasingly being tried to either control the incidence of piracy or punish piratical actions.

The impact of piracy on international trade has been difficult to measure, but as noted in Section I, it is expected that techniques and data will be developed in the several new studies underway in the U.S. and overseas. The paradox exemplified by the discussion of information economics in Section I, underlines the problems of piracy in the electronic age: though no "commodity" is stolen, the producer can be severely economically injured. Virtually all producers of intellectual property feel that piracy of their product is injurous, and this is sufficient reason for a discussion here, where extraterritorial law makes resolution even omore difficult than domestically.

Davies of the International Federation of Phonogram and Videogram Producers (IFPI) defines three types of piracy:

> 1) "**Piracy** -_stricto_ _senso_ -- is the unauthorized duplication of an original phonogram distributed to the public with labels, artwork, trade marks and packaging _different_ _from_, although often similar to, those of the original legitimate phonogram; the legitimate producer's trade mark is not used.
>
> 2) "**Counterfeiting** is the unauthorised duplication and distribution of an original phonogram and its packaging _in_ _toto_. The legitamate producer's original label, artwork, trade marks and packaging are copied as well as the sounds

contained in the original legitimate recording.

> 3) "There is a third illegal activity that is also described as piracy, namely "**bootlegging**" which means an unauthorised recording of an artist's performance...."[63]

The first two are mainly of concern here, with counterfeiting being the most insidious in the international sphere since customs officials have great difficulty in recognizing such items. Here a registration scheme would help, which we discuss below.

III.3.1 Intellectual Property Treaty Provisions.

The principal provisions for implementing the various copyright and neighboring rights conventions through international mechanisms are in terms of dispute resolution. Berne,[64] the U.C.C.[65], and Rome[66] all permit resort to the International Court of Justice, unless the countries involved agree to another forum. The Brussels Satellite Convention has no provisions for dispute resolution or enforcement. As the International Court only hears disputes between States, its jurisdiction would not cover a large number of copyright infringement cases which would have to be settled in national courts. However, an adverse decision of the International Court is not binding and, in the end, the litigating nations must solve the questions diplomatically or legislatively.[67]

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[63] Davies, G., "Piracy...", op cit, pp. 3-4. The report contains statistics on piracy, mostly for European countries.

[64] Art.33

[65] Art.XIV

[66] Art. 26

But the more direct and effective implementation relies on domestic law of member countries. Berne has a provision requiring seizure of infringing copies that come from both member and non-member countries, in accordance with national legislation.[68] Thus, Berne countries must have a seizure law, but it does not have to be within the copyright code.[69]

III.3.1.2 Tunis

The Tunis Model Law is more extensive in its recommendations. It would allow for seizure not only of infringing copies but also of receipts arising from acts of infringement and materials used to make the copies. The model law also addresses proof by allowing courts to act on statements of authors' organizations or police officers. This is apparently because of the importance of the collecting societies in policing copyright infringements.[70]

III.3.1.3 Phonograms

The Phonograms Convention is to be implemented exclusively through domestic law which must include protection by copyright or other specific right (undefined), by unfair competition laws, or by penal sanctions.[71] This provision is in accord with the trend to reach beyond intellectual property law to find effective ways to protect creative works. The remedies listed are not mutually exclusive and do not provide for national treatment. The objective here is to establish some mutually acceptable obligations between contracting States in order to put "an end to the reprehensible practices which damage legitimate interests which merit protection."[72]

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[67] WIPO, Guide to the Berne Convention, Geneva, 1978, p. 138.

[68] Art.16

[69] WIPO, Guide to the Berne Convention, p.97.

[70] Id

III.3.1.4 Rome

The Rome Convention protects performers by allowing them the possibility of preventing broadcasts or other communications of their performances to the public, as well as the fixation or reproduction of performances.[73] This leaves complete freedom of choice as to the means used to implement the Convention, and allows Members to use unfair competition, unjust enrichment, employment, penal or categories of law to enforce copyright.[74]

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[71] Art. 3

[72] WIPO, Guide to the Rome and Phonograms Conventions, Geneva, 1981, p.102.

[73] Art. 7.

[74] WIPO, op cit, p. 34.

III.3.2 National Laws.

III.3.2.1 Anton Piller Orders.

The United Kingdom and some Commonwealth countries permit a court mandated investingation of possible copyright infringing items that some view as a model. The Order is made by a court to the plaintiff without notice to the defendant in order to avoid the possibility that he will destroy or conceal the property in question. Plaintiff must convince the court that the prperty is in immediate danger or the order will not issue. The Supreme Court Act of 1981 has institutionalized the Order and also declared that the privilege against self-incrimination does not apply in intellectual property cases.[75]

III.3.2.2 Customs laws

The inclusion of intellectual property among the categories of seizeable goods enumerated in national customs laws applies customs protection to the piracy of tangible representations of intellectual property such as records, films, and video and phonograms. These goods, if not otherwise contraband, would have to be identifiable in some way from legitimate imports.

U.S. law provides for the recording of trademark and copyright registrations, and trade names, with the Customs Service. It also authorizes customs authorities to seize infringing goods.[76]

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[75] See discussion in Stewart, op cit, p. 446

[76] 19 C.F.R.Part 133.

Some commentators suggest that trademark is a more effective basis than copyright for stopping counterfeits at customs.[77] Because there are far fewer trademarks than copyrights it is easier to register them with customs and easier to identify fraudulent trademarks. A customs officer identifying an infringing trademark on a phonogram or film most likely is identifying a copyright violator at the same time.

The Customs Cooperation Council has authority to cooperate with member states whose customs laws include seizure of copyrightable works, but no direct law enforcement powers. If a customs law is directly affected by the piracy the Council can perform a somewhat more substantial role. Such a situation would occur, for example, if an importer declares that cassettes are blank when they are not, or misdeclares their value or origin.[78]

For computer software and microchips, some international system of registration would been essential to enable customs to enforce anti-piracy codes. The system would have to be a worldwide network connected to some sort of database which would permit ready identification through some method of decrypting an embedded code. Inevitably, the system would impinge upon national needs to use cryptographic techniques and agreement on such standards might be extremely difficult to accomplish. Whatever standards are set would require a lot more thought and work before any specific recommendations cculd be made in international councils.

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[77] See for example, David Goldberg, "Statement on Behalf of the United States Trademark Associaton," WIPO Worldwide Forum on Piracy of Sound and Audiovisual Recordings, Geneva, March 25, 27, 1981.

[78] See T. Lyimo, "Statement on Behalf of the Customs Cooperation Council," id.

III.3.3 Criminal Penalties.

Increasingly, industry spokesmen and commentators on copyright are recommending stringent criminal penalties against piracy. Some countries, like the United Kingdom, have a history of relying on criminal law for enforcement against certain acts that would constitute copyright or neighboring rights infringement in other countries, including the United States.[79] The Chairman of the British Copyright Council has recommended more pervasive and stronger criminal penalties than currently exist to combat piracy and states that pircacy be controlled solely by civil means. Rather he suggests an increase in the amount of fines and establishment of prison sentences.[80] The Piracy and Counterfeiting Amendments of 1982 (to the 1976 U.S. Copyright Act) increased the maximum criminal penalties for unauthorized copying to imprisonment for five years and fines of $250,000 for each offense.

Mr. de Freitas also suggests the creation of new offenses to deal with new forms of injurious conduct. For example, he would include those who assist infringers in various ways, within the ambit of criminal law.[81] This suggestion is similar to the provision of the Tunis Model Law described above.

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[79] See for example, Stewart, op cit, p. 184.

[80] Statement on Behalf of the International Confederation of Societies of Authors and Composers, WIPO Worldwide Forum on the Piracy of Broadcasts and of the Printed Word, Geneva, March 16 to 18, 1983.

III.3.4 Trade Sanctions and Inducements.

Recognizing that certain forms of international piracy are accomplished by countries as a matter of national policy, in order to boost the GNP or improve domestic living conditions, there is an increasing realization that copyright protection should be linked to trade relations.

As current U.S. policy focuses on stricter enforcement of trade sanctions and the inclusion of trade in services in multilateral and bilateral trade discussions, our own national laws provide examples of the use of trade legislation to reduce piracy. Several bills were introduced into Congress which addressed the problem of inadequate protection of U.S. intellectual property under foreign law. The Copyright Office identifies two major themes for these bills: 1) the need to integrate service-sector economic activity into the Trade Act of 1974; and 2) the terms for renewal of the Generalized System of Preferences after its expiration at the end of 1984.[82]

Two significant laws were enacted during the 98th Congress:

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[81] de Freitas, op cit.

[82] Copyright Office Report, op. cit., p. 119.

The Carribbean Basin Economic Recovery Act[83] and amendments to the Trade Act of 1974 that deal with the enforcement of United States rights under trade agreements and response to certain foreign trade practices.[84]

The Carribbean countries have traditionally engaged in both signal poaching and book piracy vis a vis the United States. Under the Carribbean Basin Economic Recovery Act, commonly called the Carribbean Basin Initiative, the United States grants valuable trade concessions in the form of economic assistance and tariff benefits to the eligible states for imports into the United States.[85]

One of the mandatory criteria for designating a State eligible for assistance is that the State not engage in rebroadcast of U.S. copyrighted material through a government-owned entity without consent of the copyright holder. In addition, there are two criteria that are discretionary with the Executive Branch. These are the extent to which countries prohibit broadcast of U.S. copyright material without owner's consent, and provide adequate and effective means in law for the protection of the intellectual property rights of foreign nationals.

In addition, the basic trade law has been amended to include violation of intellectual property rights among the unjustifiable, unreasonable or discriminatory trade practices against the United States which burden or retrict U.S. commerce. The President is authorized to take all appropriate and feasible action to enforce intellectual property rights or to obtain the elimination of policies and practices that inhibit these rights. Essentially, this provision extends reciprocity powers of the President to industries exporting intellectual property.

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[83] PL 98-67, 97 Stat. 369(1983)

[84] PL 98-573,sec. 301(e), October 30, 1984. Also the Trademark Counterfeiting Act of 1984 (PL 98-473) should also be noted.

[85] For a discussion of CBI see Copyright Office, op. cit.,pp 107-110

These provisions indicate some of the ways in which trade objectives can be used creatively to provide incentives to foreign countries to control piracy and to establish legal protections for intellectual property. There are likely to be more of these from the U.S. and other information exporting nations in the future.

III.4 Satellite and Cable Signals.

III.4.1 Cable.

Cable transmission, or communication to the public by coaxial cable or optical fibers will be used increasingly, in connection with satellite transmission, to carry programs to audiences at great distances from the programs' points of origin.[84] Between the U.S. and Canada this is already a reality. In Europe "the development of communications is opening up the possibility of delivering broadcast programmes from other Member States via microwave links, long-distance cable or telecommunications satellites and distributing them through domestic cable networks."[85]

Some conventions have provisions relating to cable, WIPO and UNESCO have drafted annotated principles for protection of authors and others whose works are distributed by cable. The knottiest legal problem concerning cable is whether and on what terms to establish copyright protection for the various participants in creating and producing broadcast programs which at the time of broadcast are simultaneously retransmitted by cable to a partially or entirely different audience than received the original broadcast. When the cable retransmission crosses national boundaries this problem is complicated by differences in national laws and difficulties in designing adequate schemes to compensate copyright owners.

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[84] The technology of coaxial cable and fiber is documented in numerous sources. More complex for future copyright issues will be the ability to switch broadband video and high-fidelity audio signals on telephone-like networks. This is the subject of the so-called Integrated Services Digital Network (ISDN) described in terms of copyright problems in Solomon, op cit. Note that in Europe there are several experiments for switched video via fiber lines, and the EC has proposed leapfrogging ISDN with integrated broadband (IBN) networks. Obviously, cable will have negative impacts on conventional satellite systems, if IBN comes to pass.

[85] European Commission, Televison Without Frontiers, "Green Paper on the Establishment of the Common Market for Broadcasting, Especially by Satellite and Cable," Brussels, 14th June 1984. COM(84) 300 final. Report to the European Parliament. Also see EC, "Interim Report: Realities and Tendencies in European Television," COM(83) 229 final, 25 May 1983.

III.4.1.1 Berne

Berne specifically grants authors and film makersthe exclusive right to authorize both the initial broadcast and the wireless diffusion of their works.[86] According to the WIPO Guide to Berne, the primary right is to authorize the broadcasting of a work and its communication to the public by wireless diffusion. The focus is on the emission of signals, not on whether they are received. A secondary right relates to the subsequent use of this emission, that is its simultaneous use by a cable system, if the cable diffusion is intended for the public, and is made by an organization that is separate from the original broadcast organization. [87]

The Article raises two significant questions including: 1) whether transmission of a signal to a satellite intended, with the aid of an earth station, for public distribution by broadcast or cable constitutes broadcasting; and, 2) whether the licence given by an author to a broadcaster covers in addition all uses made of the broadcast. Berne answers the second question "no" and leaves the first in doubt.[88] Other conventions also raise these questions.

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[86] Art 11bis (1); Art.14(1)(ii)

[87] WIPO, Guide to the Berne Convention, pp. 66-67.

III.4.1.2 Rome

The Rome Convention defines broadcasting and rebroadcasting so as to exclude diffusion by cable.[89] Therefore, broadcasters, and phonogram producers are not protected against cable retransmission. Performers are only protected if the performance is live.

III.4.1.3 Brussels

The Brussels Convention protects broadcasters against the unauthorized use of broadcasts by cable operators, but permits national law to make reservations regarding cable and other transmission by wire.[90]

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[88] WIPO, op cit, pp. 67-68

[89] Art.3(f),(g). See Section II.4, supra.

[90] Art.8 (3)(b). See Section II.6, supra.

III.4.1.4 UN Principles

The Annotated Principles of Protection of Authors, Performers, Producers of Phonograms and Broadcasting Organizations in Connection with Distribution of Programs by Cable[91] represents the combined attempt of three United Nations organizations to establish guidelines for national laws governing cable retransmission, especially across national boundaries. Without reviewing the provisions of this document, it is worth emphasizing some of the introductory remarks that describe the conceptual problems requiring resolution prior to drafting cable legislation or conventions.

The document represents that there is international concensus that the redistribution by cable to the public of works being distributed by satellite or ground broadcast facilities represents a distinct act of using these works. This is because the cable redistribution is effected either for a different public from the broadcast audience or one that the broadcast can only reach at diminished quality or higher cost than the cable. Consequently, cable retransmision is a separate use of the copyrighted works contained in the broadcast, as well as the broadcast itself.[92]

The principles note that, because of the various categories of rights requiring protection (authors, producers, broadcasters, composers, etc.) collective licensing will be necessary. While acknowledging that, based on experience, this is feasible, the report recommends that it be done only by voluntary societies with use of a compulsory license a last resort.[93] Interestingly, the U.S. representative acceded to this recommendation.[94] Although Berne would allow a compulsory license for simultaneous retransmission if considered desirable under national law, it would limit its application to the countries establishing such a law. Furthermore, no compulsory license law could interfere with moral rights or the right to obtain equitable remuneration.[95]

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[91] ILO/WIPO/UNESCO, Copyright Bulletin, Vol. XVIII. No.2, 1984.

[92] UNESCO, op cit, p. 15

III.4.1.5 European Community

The European Commission's Green Paper is concerned about the nondiscriminatory carriage of programs on a cable network in accord with a provision of the Treaty of Rome that guarantees freedom to provide broadcasting services via cable.[96] The report recommends that national laws provide that foreign broadcast signals fed into the system of any EC country transmitting broadcasts in that language according to some predetermined system which provides these foreign broadcasts equitable access to the domestic cable market.[97]

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[93] UNESCO, op cit, p. 16. See Section III.2 supra.

[94] id, p. 83.

[95] Art. 11bis (2)

[96] EC, op cit, p.119; Treaty of Rome, Arts. 59 and 62

[97] EC, op cit, p. 120

This recommendation addresses, not just the protection of foreign works, but access of these works to domestic distribution channels. This is in accord with the general antimonopolistic thrust, at least among European Community members, of the Treaty of Rome.

III.4.2 Satellite.

The significant features of the Brussels Satellite Convention have already been discussed (supra Sect III.4.1.3 and Sect. II.6) but, because satellite distribution of programs over long distances will enhance international program distribution, it is important to look at other relevant treaty provisions or options.

Berne does not define broadcasting. The only internationally recognized definition available at the time that Berne was amended to include broadcasting (1948) is found in the ITU Radio-Communications Regulations which refer to "transmission intended to be received directly by the general public."[98] This raises the question of whether non-DBS satellite transmission is included within Berne.

The UCC grants a broadcasting right but it is vaguer and has wider exceptions than Berne. These may give member states the option to intepret the broadcasting right widely with regard to the inclusion of satellite broadcasting.[99]

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[98] Stewart, op cit, p. 300.

[99] Id

The U.S., in ratifying the Brussels Convention, apparently has indicated its belief that UCC does not cover satellites.

Rome defines broadcasting so that it is unclear whether satellite transmission is included. The convention's draftsmen did not have satellite broadcasting in mind. Its inclusion depends on whether the phrase "public reception" in the definition of broadcasting applies to transmissions from a satellite to an earth station.[100]

Stewart discusses a significant problem which has been resolved by the Brussels Convention for the few nations that have ratified it. One view is that, since the signal is not directly receivable by the public, but requires the intervention of an earth station at the other end, it is not broadcasting (and therefore could not come within Berne or the UCC). The other view is that all the phases of transmission are integral parts of one operation and that, therefore, the entirety of satellite operations is a broadcast. One commentator takes a middle view that the signal emission is a broadcast under Berne and therefore the works transmitted qualify for protection. The Satellite Convention protects the signal (that is, the broadcaster's right) but not the author's rights.[101]

According to Stewart, it is clear that the language of both Berne and the UCC will apply to DBS because their characteristics will be the same as traditional broadcasting by ground stations. This will give rise to a significant question as to the size of the territory covered by the broadcast, the size of the audience, and how to take these into account when determining the royaly payable by the DBS organization.[102]

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[100] Stewart, op cit, p. 301.

[101] Ibid. pp.300, 301.

The EC Green Paper expresses concern that technical methods may be used to create national reception zones for satellite transmission which would limit transborder transmissions among EC countries. The EC member countries subscribe to ITU Radio Regulations, one of which[103] requires countries to use all technical means available to reduce, as far as practicable, the radiation from satellites over the territory of other countries unless an agreement has been reached with other countries.[104]

This, in the view of the EC Green Paper, would negate the antimonopolistic and antidiscriminatory thrust of the Treaty of Rome in a way somewhat different than the limitations on cable retransmission. It apparently directly negates the ban on discrimination against cross frontier radiation within the community found in Articles 59 and 62 of the Treaty of Rome.[105] Although the EC's concern does not directly affect the United States, it illustrates problems resulting from membership in international conventions with conflicting provisions, as well as the acceptance by the EC of the concept of transborder satellite broadcasting.

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[102] Ibid, p. 302.

[103] Art. 7 of the Executive Order for the ITU, Radio Regulations, 1981.

[104] See Sect. II.6, footnote 40; and "Realities in European TV," op cit., especially the appendix which indicates spillover problems. Also see Internation Networks, Sept, 1983, and Oct 1984.

[105] EC, op cit, p 122, and International Networks, Oct 1984.

III.5 Problems of Developing Countries.

Developing countries in general do not accept the "author's exclusive right" theories of *droit morale* and economic copyright which are the basis for Berne, UCC and the neighboring rights treaties. They consider that national intellectual property law should reflect the needs of all of the people in their countries. This includes facilitating public access to creative works especially for the development of science, education and culture.[106] As copyright increases the cost of books, it makes them more expensive to purchase. The same theory would apply to more technologically sophisticated creative works such as packaged computer software for microcomputers. That this is a growing problem is indicated by efforts by such emerging industrial powers as Brazil to change the concepts of copyright, as noted above (Section III.1.2.1).

Developing countries tend to be net importers of copyrightable products and rely on more advanced countries to supply them with the materials they need to enhance their economic and cultural development. In the 1960's representatives of these countries became vocal in their protests at being cut out of access to intellectual products. Advanced countries in return were, and remain, concerned about developing countries pirating copyrightable works because they cannot afford to pay market prices for them. As an outgrowth of this concern, and the desire of industrialized countries to include all countries within the ambit of international copyright law, committees of both Berne and the UCC met in the late 1960's to develop convention provisions responsive to needs of developing countries.

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[106] Nora Maia Tocups. "The Development of Special Provisions in International Copyright Law for the Benefit of Developing Countries." Journal of the Copyright Society of the USA, NYU Law Center, Vol. 29, No. 4, april 1982, p. 402.

In 1971, WIPO and UNESCO held Paris Diplomatic Conferences on copyright and revised Berne and the UCC with similar language to assist developing countries in acquiring intellectual property by legitimate means. Berne created an appendix of special provisions for developing countries to allow certain countries more latitude regarding translation and reproduction rights than is normally allowed by the Convention. The system laid down in the appendix allows developing countries to provide for a regime of non-exclusive, non-assignable compulsory licenses which oligate it to make fair payment to the copyright owner, to translate and/or reproduce works protected by the Convention exclusively for systematic instructional activities, scholarship or research. This includes the use of materials by broadcast organizations.[107] The UCC contains similar provisions.[108]

The Brussels Satellite Convention contains a provision directed at developing countries. It permits the distribution on territories designated by the Secretary General of the United Nations as developing countries of program-carrying signals unintentially emitted from satellites under onespecific circumstance. That circumstance is the distribution solely for the purpose of teaching, including teaching in the framework of adult education or scientific research.[109]

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[107] WIPO, Guide to the Berne Convention, p. 147

[108] Art. V bis, Art. V quater.

The revisions of Berne and UCC containing the developing countries provisions have not been accepted by many signatories. The Satellite Convention has few Members. It is obvious that, if the view of developing countries is to prevail, there will have to be continuing work on the part of WIPO/UNESCO and the affected countries themselves to convince the world community that special dispensations from copyright protection are in every nation's interest.

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[109] Article 4(iii).

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NATIONAL ACADEMY OF PUBLIC ADMINISTRATION

"Organization for Protection of Intellectual Property Rights"

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ORGANIZATION FOR PROTECTION OF INTELLECTUAL PROPERTY RIGHTS

Introduction

As part of its assessment of "Intellectual Property Rights in an Age of Electronics and Information," the Office of Technology Assessment is analyzing how technological change might affect the goals and functioning of United States agencies concerned with the administration and protection of intellectual property rights. As part of this study, OTA has requested the National Academy of Public Administration to:

- Identify and describe the history of existing institutional arrangements and the rationale for the present structure.
- Evaluate and describe the current mission and responsibilities of these organizations, particularly for communication and information technologies.
- Suggest such changes as might be required in the existing structure to respond effectively to the demands of new technologies.

The organizational analysis is undertaken in conjunction with studies undertaken by OTA on (a) technological and other developments affecting intellectual property in today's environment, (b) the role of collecting societies in the administration of intellectual property rights, and (c) the role of the courts in the enforcement process. The nature of and rapid changes in technology are creating stresses on the market mechanisms, the legal framework for protecting property owners, and relations with other countries. The use of collecting societies to mediate between intellectual property owners and users has served as an alternative to government regulation. Problems faced by the courts in coping with issues that arise from new technologies need to be understood in framing actions to strengthen the overall system for protection of intellectual property.

Definitions and Scope

Intellectual property includes patents, trademarks and copyrights, defined as follows:

- A patent is the grant of exclusive rights to make, use or sell, a new and useful invention or ornamental design for a limited time.[1] A utility patent provides protection for 17 years from issuance; a design patent protects for lesser periods. Infringement occurs on proof of making, using, or selling an invention or design from patents issued.

- A trademark is registered to protect words, names, symbols or other devices that serve to distinguish one's goods or services. Federal registration provides protection for 20 years and is renewable for an additional 20 year period.

- A copyright is registered to protect writings, music, and works of art that have been reduced to a tangible medium of expression. While federal law protects intellectual property rights once a work has been reduced to a tangible medium, such rights are enforceable only on issuance of a Registration Certificate. Protection extends for the life of the author plus 50 years. The copying of protected subject matter constitutes infringement.

The term "intellectual property" is also used to encompass trade secrets, which are not protected under federal law. The term may be used in reference to technical data resulting from research and development as well.

Agencies with significant responsibilities for protecting intellectual property rights are the:

Legislative Branch
- Copyright Office
- Copyright Royalty Tribunal

Executive Branch
- Department of Commerce
  - Patent and Trademark Office
  - Office for Productivity, Technology and Innovation
  - International Trade Administration
  - National Telecommunications and Information Administration
  - National Technical Information Service
  - National Bureau of Standards
- Department of State - Office of Business Practices
- Department of Justice - Antitrust Division
- Office of the United States Trade Representative
- United States International Trade Commission

Historical Background

When this country was being formed, the protection of the products of intellectual effort was an established tradition. British legal principles were well known to our constitutional fathers. John Locke had stated that "every man has a property in his own person. The labor of his body and the work of his hands we may say are properly his." To protect the British book trade and to stifle heresy stemming from the Protestant Reformation, a royal decree in 1556 established a copyright system. Statutory recognition of the rights of authors was first accorded by the Statute of Anne in 1710. In America, the separate states enacted copyright legislation before 1789.[2]

The United States Constitution (Article 1, Section 8) provides that the Congress shall have power "to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." In his first annual address to the Congress, President Washington urged enactment of a patent law. Legislation passed in 1790 created a board composed of the Secretary of State, the Secretary of War, and the Attorney General to review applications for patents. As the Secretary of State, Thomas Jefferson became the first patent administrator.

In 1793 the patent system was installed at the Department of State. At that time, patent applications were routinely approved rather than subject to systematic examination. Dissatisfaction with this process led in 1836 to the creation of a select committee of three Senators to investigate conditions. Legislation enacted that year created a Patent Office as a separate bureau of the Department of State. The Commissioner of Patents was to be appointed by the President, subject to confirmation by the Senate. Patent applications were to be approved only upon meeting standards of novelty, utility and invention. Patent grants had a prima facie standing of validity in courts. Thus the Patent Office was vested with quasi-judicial as well as executive functions.

In 1870 the Commissioner of Patents was authorized to register trademarks. The Supreme Court held such legislation to be unconstitutional because trademarks did not cover a product of authorship or invention. Subsequently, the Court found that registration of trademarks was permissable under the power to regulate commerce.[3]

The Patent Office was transferred to the Department of the Interior when the latter was created in 1849. Not until 1925 was the Patent Office placed in the Department of Commerce.[4]

Copyright protection was also assigned initially to the Department of State. In 1859 the function was transferred to the Department of the Interior. The Library of Congress had been established in 1800 but it was not until 1870 that the Librarian was vested with all copyright and depository functions. A Register of Copyrights as head of the Copyright Office was established by law in 1897.

The types of work covered by copyright protection have steadily grown as Congress has acted to fill gaps and clarify ambiguities revealed in litigation. Coverage has been expanded to include: designs, engravings, and etchings (1802); musical compositions (1831); dramatic compositions (1856); photographs and negatives (1865); statuary and models (1870); all writings of an author (1909); motion pictures (1912); sound recordings (1972); original works of authorship (1976); computer software (1980); and mask works for semiconductor chips (1984). This steady extension offers a historical record of the progress of technology in affecting rights in intellectual property.

From its beginning the copyright process has involved a simple system of registration without the stringent examination accorded patent protection. A copyright to be registered is to be "original" and "fixed" in a tangible medium of expression which can be perceived, reproduced, or otherwise communicated. An observor has said, "The process lays down a public record and brings work under official security; and though the record is supplied *ex parte* and the official look is very superficial, there is value in both."[5]

Unpublished works were brought under the Copyright Act of 1976 so there is no longer a need to rely on common law principles in infringement actions. That legislation also preempted state laws on copyrights.

During the 19th century the United States lagged in providing copyright protection to foreign nationals. Piracy of works by foreign authors was common. The popular Charles Dickens was victimized by such piracy. Upon unexpectedly receiving a royalty check from an American publisher, he exclaimed, "What a fine, what a generous, what an un-American thing for him to do."[6]

Under the 1863 Berne Convention, signatory countries were prevented from discriminating against foreign authors and required to accord uniform treatment in protecting copyrighted works. The United States has never been a signatory to this convention. Congress enacted legislation in 1891 to extend protection to foreign authors, thus following the precedent of laws enacted by France in 1810, and by Great Britain and most of the German states in 1837.[7]

Meanwhile special treaty arrangements had been made with many countries to provide reciprocal protection of patents and trademarks. In 1887 the United States ratified a convention in which the contracting countries agreed to protect each others' patents and trademarks. This country is now a signatory to the Universal Copyright Convention that protects published and unpublished works of other countries' nationals. International conventions do not provide international copyrights or patents but do assure consistency of treatment among citizens of signatory countries.

In one way or another, the United States laws for the protection of intellectual property have managed to adapt to technological change. Some key elements of the system—registration of copyrights and issuance of patents—have remained much as they were when originally established. At various points in history certain doctrines have been modified to accommodate motion pictures, sound recording, radio and photocopying. The question is whether the system, as in the past, is capable of adapting to current technological developments or whether it must be fundamentally altered or abandoned altogether.

After surveying past developments, Anne Branscomb has concluded that such accommodations occur in a variety of ways, "(1) by self-help within the economic institutions affected, (2) by expansion of the common law through judicial decision based upon fair play and equity, (3) by expanding judicial interpretation of existing statutes, (4) by generic legislation (e.g., patents, copyright, right of privacy, export control, misappropriation), (5) by amendment of the current statutes, (6) by a general revision of the basic law—about every 100 years, and (7) by specific legislative amendments addressed to the particular characteristics of a specific technology."[8]

In charting a course for the future it is necessary to explore how changes in information and communications technologies might affect the viability and effectiveness of the set of institutions that have been established to address intellectual property issues. Determining the optimal organization of federal activities must take into account arrangements in the private sector for protection of intellectual property. A summary of recent developments that raise difficulties is provided below, followed by a discussion of salient policy implications.

Recent Developments

Current issues arise from the following technological developments: computers, including software and semiconductor chips; satellites, domestic and international; genetic engineering of microorganisms; videocassette recorders (VCR's); television; and xerography.

These issues primarily concern:

- Standards for Protection
  - The utilitarian nature of some computer software challenges the traditional distinction between patents and copyrights.
  - Computer software may fall somewhere between embodiment of a new idea, which a patent protects, and the form of an expression, which a copyright protects.
  - Easy manipulation of digital information jeopardizes established distinctions between authorship and derivative works and may threaten the significance of "originality."
  - Online data bases may not conform to copyright requirements of "fixation" and "deposit."
- Enforcement of Rights
  - Development of new technologies has seriously complicated the problem of enforcing intellectual property rights.[9]
  - The Congress and courts have invoked the principle of "fair use" for use of copiers in libraries and for taping television programs by VCR's, which is often unenforceable in practice.[10]
  - The networking possible through information technologies permits ready access to copyrighted material, e.g., software for personal computers.[11]
  - Technological fixes, such as requiring the use of a host computer or scrambling messages to protect material, may not be technically feasible or may meet with user resistance.
  - Piracy has been facilitated by the advent of inexpensive copier technologies which makes it far more economical to copy products than to buy them.

- The globalization of information in an electronic age has made enforcement of intellectual property rights a growing concern in foreign affairs.

- Ownership of Intellectual Property

  - Growing collaborative arrangements between industry and universities have implications for proprietary control of results of research.

  - Rapid progress in moving from basic to applied research—a process in which individual investigators, universities, industrial laboratories, and federal agencies may all be participants—can make it difficult to identify which party made the key contribution to an invention.

  - Ownership of scientific and technical data is complicated by the public's demand for information in areas of great interest.

  - Government sponsored R&D raises the issue of whether the sponsor or the contractor should take title to inventions.

The developments outlined above need to be weighed in the context of long-range strategic considerations. It is necessary not only to understand the existing governmental and private arrangements for dealing with intellectual property, but also to identify and describe how present and future developments, brought about by technology, might affect the functioning of the overall system for protection of intellectual property. A brief description of some potential developments that might have far reaching policy implications is provided below.

1. The rapidity and uncertainty of changes in information and communications technologies. Technological advances in and the growing convergence of computer and communications technologies, together with the deregulation of the telecommunications industry, will greatly enhance the public's access to information products and services and will significantly affect the process by which intellectual properties are created, produced, and used. As a result, such technological advances are likely to have a somewhat disruptive effect on the nature of the intellectual property system as it exists today.

The unprecedented speed with which these changes are taking place, and the difficulties entailed in trying to predict the form that they will take, confound efforts to design legislation that will continue to be relevant and useful over time. It was for this reason, for example, that technological gaps soon developed in the 1976 copyright law and its 1980 amendments, even though the law itself was specifically designed to take the emergence of the new technologies into account. As was illustrated in the case of Apple Computer, Inc. v. Franklin Computer Corporation, for example, the law failed to address the important question of whether copyright law applied to operating code that is readable for the most part only by machine, or to information that is embedded in hardware. And, as the case of Sony Corporation of America v. Universal City Studies demonstrates, the law failed to anticipate the rapid growth of the home market for video cassette recorders and how this widespread use of VCRs might affect the intellectual property rights of the film industry. It is not surprising, therefore, that the number of intellectual property related bills seeking to accommodate legislation to the changing technologies has greatly increased over the past few years.

Given the rapidity of, and uncertainty with respect to, changes in information and communications technologies and their impact on the intellectual property system, the question might be raised as to whether the existing institutions that were established to address intellectual property issues are either equipped with or are capable of developing an on-going process to assess and plan for technological change.

2. The growing demand for non-traditional copyright solutions which require a regulatory approach. The rapid development of and growing access to the new information and communications technologies has strained many of the traditional

mechanisms by which intellectual properties have been protected and by which the creators, producers, and distributors of intellectual properties have been remunerated. Under the traditional approach, the law defines property rights and lets those who possess them negotiate their value either in the marketplace or in a private, decentralized fashion. A more regulatory approach looks to public authorities to determine and allocate value.

In either case many modern technologies provide for decentralized access and require that information be handled electronically, their use can be carried out covertly and is, therefore, less subject than in the past to monitoring and control. Moreover, generating new uses and users of intellectual properties, these technologies are attenuating the process by which intellectual properties are created, published, distributed, and used, and are altering some of the traditional roles of, and relationships among, actors in the intellectual property system. As a result, many of those involved are seeking new kinds of rights and forms of remuneration. Directors, for example, are looking for ways to receive property rights protection for their particular contribution to stage and film production. The Motion Picture Association of America, moreover, is seeking the right to be paid a fee for the reception of retransmitted broadcasts by owners of satellite dishes.[12]

To overcome some of the enforcement problems generated by the new technologies, and to take into account the new kinds of claims for rights, a number of laws and bills depart from the traditional intellectual property scheme, requiring significant government involvement for their implementation. Under a compulsory licensing scheme, for example, Section 116 of the 1976 Copyright Act requires juke box operators to pay royalties to the copyright owners of nondramatic works. To execute this requirement, the law obliges the Copyright

Office to register and license operators of juke boxes and the Copyright Royalty Tribunal (which at the time was not yet constituted) to determine the legitimate claimants of fees and to allocate royalty payments equitably among them. Similarly, the proposed Home Recording Act of 1983, designed to circumvent the problems of enforcement by compensating copyright owners with a royalty payment, called on the Copyright Office to initiate arbitration proceedings to determine the royalty schedule and on the Copyright Royalty Tribunal to determine and allocate the funds collected among competing claimants.

With the exception of the fledgling Copyright Royalty Tribunal, however, the institutional arrangements that have been established in the United States to address intellectual property issues were designed, for the most part, to function within a free market, non-regulatory framework. To the extent that new legislative initiatives call for a more regulatory approach to solving intellectual property problems, the question is raised as to whether and as to how well the existing set of institutions will be able to take on new roles and adapt to a new environment.

3. The need for a greater understanding of the processes by which intellectual properties are created, published, distributed and used. Under the traditional copyright scheme, there is little need to know the precise economics of the process by which intellectual properties are created, published, distributed, and used. For under such a system, property rights are defined and granted to authors by law, and the economic value of those rights is determined and distributed by market forces. To the extent that intellectual property law is tending towards a more regulatory approach, however, more information and a greater understanding of this process will be needed.

The widespread deployment and use of the new information and communications technologies has complicated the traditional intellectual property process, making it difficult—but perhaps at the same time more important—to know where economic value is added, and thus, how to determine economic incentives and rewards. These technologies, for example, have not only greatly increased the users and uses to which intellectual properties can be put; by doing so, they have also served to extend the process, and with it the opportunities throughout that process to enhance the value of creative and innovative works. No longer is it one "author" but rather a series of "authors" whose claims to intellectual property rights need to be sorted out. No longer is it one publisher, or one producer, but rather a variety of different kinds of publishers and producers whose economic stakes need to be taken into account.

To resolve the numerous and varied competing intellectual property claims within a regulatory, as opposed to within a market, framework will be very difficult. It will require policymakers to develop an analytic rationale for the optimum charging of fees and the economically efficient and socially equitable distribution of rewards. To do so, they will need to know some relatively detailed information about all of the parties at stake, their relative roles in the intellectual property process, and how each might fare under alternative scenarios. Illustrative of the kinds of information that might be required to develop such a rationale are the considerations that the proposed Home Recording Act of 1983 specified should be taken into account when setting royalty fees for the manufacturers of recording devices. No less than ten factors were cited, including among them:

o the value to an individual of the right to reproduce copyrighted works,

- the projected effect of royalty fees on the structure and financial condition of the motion picture and audiovisual production industries and the video recording device or media importing and manufacturing industries, and

- the relative roles of copyright owners and importers and manufacturers of video recording devices or media with respect to creative and technological contribution to the development of motion pictures and other audiovisual works.

At present, reliable information of this kind is not readily available. Given the growing complexities in the intellectual property process, brought about, in part, by technological developments, it is exceedingly difficult, for example, to determine such things as who in fact is an author; at what point and by whom new value is added on to an existing intellectual property; and what actually constitutes copying or use and, therefore, might require remuneration.[13] Estimates of damages due to infringement of intellectual property rights are also difficult to obtain. Most of those that exist are not only unsystematic in their approaches; they are also somewhat suspect insofar as they have been commissioned, for the most part, by the very parties whose interests are at stake.[14] It is clear that in substituting a regulatory for a market approach in addressing intellectual property issues, analytic and expert support must be made available to those organizations called upon to implement and administer the law.

4. The development of technologies that do not correspond to old intellectual property categories, and the creation of "sui generis" intellectual property legislation. The framers of the Constitution distinguished between writings and inventions, setting up separate rules and incentive systems for each. This distinction was relatively clear-cut so long as writing merely explained an art, rather than embodied the art itself. Today, however, this distinction is harder to maintain as new technologies have emerged that do not clearly fit into either one or the other category. Because information technologies allow symbols to

define a process, and to function as part of a machine, for example, they tend to blur the boundary between writings and inventions, between ideas and their expressions, and between functions and their representations. This blurring of the boundaries has raised the question of what kind of intellectual property protection is most appropriate for these technologies and has led to the establishment of "sui generis" intellectual property legislation.

One of the first of the new information technologies to raise questions of this kind was computer software. There has been controversy surrounding the issue of the copyrightability of computer software ever since the mid-1960's when the Copyright Office first began to register programs in their object code form under its "rule of doubt." Much of the controversy was rooted in the 1909 Supreme Court decision in White-Smith Publishing Co. v. Appollo Co., which held that a player piano role was not copyrightable since it did not embody a system of notation that could be read and, thus, was not a copy of a musical composition but rather a part of a device for mechanically performing music. Because program object code was said to resemble a piano roll in its unperceptability, questions were raised as to whether it could be copyrighted. Subject to a history of considerable controversy and litigation, this issue was finally resolved within the context of the traditional intellectual property scheme by including computer programs within the domain of copyright protection.[15]

Unlike the case of computer software, the question of how semiconductor chips might best be protected was resolved not within the framework of existing intellectual property law but rather with sui generis legislation. Under traditional intellectual property law, the semiconductor chip was without protection. Being a utilitarian article, it did not fit within the traditional concept of copyright. On the other hand, the level of originality embodied in a chip mask did not meet the standards of originality required for patent protection. To provide protection for this new technology without undermining the integrity of the law and the historical principles underlying the distinctions between copyright and patent protection, the Congress created a new class of protection with the passage of the Semiconductor Chip Protection Act of 1984. While similar in many respects to existing copyright law, it differs insofar as it provides protection for only ten years, permits reverse engineering, and excludes from protection designs that are commonplace, staple, or familiar. Because the procedures for registration are similar to those for copyright, the Copyright Office was given the responsibility for the new law's administration.

The organizational structure that was established to administer intellectual property law evolved in accordance with the distinctions that had been made between patent and copyright protection. To the extent that new technologies require intellectual property protection that falls outside of the traditional realms, they may require significant organizational changes.

5. The growing convergence of intellectual property issues with other international issues. Historically, intellectual property laws and practices in the United States have been developed without great regard for what was taking place in the rest of the world. However, the new technologies have served to greatly increase the flow of information and information products and services across national boundaries, enhancing their value in international trade. Because intellectual property protection is needed to preserve this value, intellectual property policy is increasingly being brought to bear in matters involving international trade policy. The Trade and Tariff Act of 1984, for example, allows the generalized system of preferences to be renewed only if the country involved respects U.S. intellectual property rights. Similarly, the Caribbean Basic

Economic Recovery Act of 1983 withholds foreign aid from those countries who fail to honor intellectual property rights.

The growing importance of information products and services has also served to link intellectual property policy with general matters of international politics. Seeing information technologies and information products and services as a means to social and economic development, many developing countries view U.S. intellectual property policies as a barrier to their own advancement.

To the extent that intellectual property issues continue to converge with those of international trade and international politics, questions arise as to whether or not the present organizational structure, designed to consider intellectual property from a domestic frame of reference, is adequate or whether or not some strengthening is required to deal with international issues.

6. The convergence of intellectual property issues with other information policy issues. The structure and the basic assumptions underlying American intellectual property laws and practices were designed in a period when the United States was an agrarian society, and when communications and the use and exchange of information played a relatively minor role. In such a society, decisions about intellectual property could be made relatively independently from other policy issues. It was assumed that, through the operation of the law, social and economic goals would be jointly served, and thus the benefits to society would be maximized.[16]

Today, however, the role of information technologies and information products and services has been greatly enhanced. These technologies and their applications are being used not only by individuals to enrich their lives, and by businesses to enhance their productivity; they are also being used by national governments as a means to achieve major, societal goals. Likening the growing connection of information-processing and communications technologies throughout the world to a change in "the entire nervous system of social organization," the French government, for example, plans to play a major role in their development and to direct it in a way that is consistent and supportive of the Nation's overall societal goals.[17]

In the information society envisioned,[18] there will be a greater interdependence between information and communications technologies, and intellectual property issues may increasingly converge with other matters of information policy—such as telecommunications policy or privacy policy. Anticipating such connections, S. 786, a bill entitled the "Information Age Commission Act of 1985," was recently introduced into the Senate. If passed, this legislation would establish a commission to investigate issues relating to the Information Age, such as intellectual property rights, computer education, computer crime, and privacy in a comprehensive and systematic way.

To the extent that intellectual property issues converge with other information policy related issues, the present set of intellectual property organizations may not be capable of dealing with these issues as they cut across one another.

Principal Actors

No single agency is responsible for the protection of intellectual property. Primary responsibility for administering the patent, trademark and copyright laws is vested in the Patent and Trademark Office and the Copyright Office, but key roles are assigned to other agencies, with supporting roles played from time to time by still others. To facilitate cooperation of the agencies, high level interagency committees have working groups on intellectual property that address issues which cannot be resolved at the working levels. Private collecting societies also play an important role in the protection of intellectual property.

Federal agencies engaged in the protection of intellectual property perform the following roles: (a) administer the basic laws, (b) provide support services, (c) enforce the laws, and (d) conduct international negotiations.

Administration

Responsibility for administering provisions of the patent and trademark, and copyright laws is vested in the Patent and Trademark Office, the Copyright Office and the Copyright Royalty Tribunal.

> The Patent and Trademark Office (PTO) is headed by a Commissioner with the rank of Assistant Secretary of Commerce. Patent applications are stringently examined to determine entitlement to a patent for a claimed invention. Trademark applications are reviewed to determine whether they meet statutory criteria for registration as a trademark. In 1982 application fees were sharply increased. Fees collected now cover operating costs for registering trademarks and will soon cover 60% of the costs of the patent system. The staff of patent examiners are highly specialized in engineering and scientific fields. In reviewing applications examiners have access to 26.5 million documents that are searched manually to identify the prior state of the art. There is a 27 month backlog of 440,000 cases. While the trademark process is substantially automated, the automation of patent searches is just getting underway. The goal is to complete automation by the early 1990's.

The Copyright Office (CO) of the Library of Congress records copyright assignments, claims, and renewals. A Licensing Division administers compulsory licensing provisions for cable and non-commercial television, jukeboxes and phonorecords. Royalty payments for records and non-commercial television go from the licensee to the copyright holder. The other royalty fees received by CO are deposited with Treasury until distribution is made to claimants.[19]

The registration process has been substantially automated. The CO staff are not assigned to specialized areas, with the exception of music. The copyright function is not integral to the operation of the Library since the registration and the deposit of materials are handled separately. There is little need for coordination with executive branch agencies on domestic copyright matters. However, CO works closely with other agencies in international negotiations affecting copyright protection.

The Copyright Royalty Tribunal (CRT) is an independent agency of the Legislative Branch headed by five commissioners who are appointed by the President subject to Senate confirmation. The agency has a total staff of four. The CRT engages in rulemaking proceedings to set royalty rates for four compulsory licenses: cable television, non-profit television, jukeboxes, and phonorecords. The law fixed rates in these areas, subject to periodic adjustments, but provided CRT with complete discretion to set certain cable rates after deregulation of cable television by the Federal Communications Commission. The CRT's adjudication function entails annual distribution of cable television and jukebox royalties to claimants. Extensive hearings are held where claimants make their case. Decisions are often appealed to the courts. Royalties for records and non-commercial broadcasting are distributed without the intervention of CRT through private organizations such as the American Society of Composers, Authors and Publishers (ASCAP).

Supporting Services

A number of offices and agencies of the Department of Commerce provide support to intellectual property activities. Such support draws upon the industrial, technical and scientific expertise of the following agencies:

The International Trade Administration (ITA) was established by the Secretary to strengthen the trade and investment position of the United States. Counselling is provided to members of the business community on export opportunities and problems. ITA offices abroad help to identify potential markets. A recent reorganization, along lines proposed by the Grace Commission, has merged industrial specialists in such areas as computers and telecommunications with trade promotion staff to bring more specialized knowledge in trade negotiations.[20] ITA administers the Export Administration Act to ensure that export activity is consistent with national security and foreign policy objectives. A current priority is prevention of the illegal transfer of technology. Control of technical data poses enforcement problems because such intangibles as consulting arrangements and training of foreign nationals are covered. In issuing export licenses clearances are routinely required from the Departments of State and Defense.

The National Telecommunications and Information Administration (NTIA) manages the Government's use of the electromagnetic spectrum. NTIA provides telecommunications users, within and outside government, with techniques for evaluating telecommunications systems performance. It also provides methods that allow multiple users to simultaneously use the same area in the spectrum. The agency has a research laboratory for scientific support.

NTIA is responsible for protecting copyrighted material transmitted outside the U.S. through telecommunications. Therefore, on behalf of the U.S. it negotiates international agreements on the use of satellites and the rebroadcast of U.S. television programs. With respect to such rebroadcasts, this country has been working closely with Canada and several of the Caribbean countries.

The National Technical Information Service (NTIS) serves as a government clearinghouse for technical information. NTIS issues notices to the public that a government agency has applied for issuance of a patent or has been issued a patent by PTO. Private organizations and individuals can then determine whether to apply for a license.

NTIS acts as an agent for nine departments and agencies in support of the patent process. These are the Departments of Commerce, Health and Human Services, Interior, Agriculture, Army, Air Force, Transportation, the Veterans Administration, and the Environmental Protection Agency. Special promotional efforts are made to encourage licensing of those agencies' patents. NTIS issues licenses for those agencies.

The National Bureau of Standards (NBS) maintains an Institute for Computer Sciences and Technology to help develop standards for computer technology, provide technical assistance to federal agencies in the procurement of computers, and conduct research in support of standardization of computer technology.

The Institute has been represented on an advisory group to the Patent and Trademark Office in developing plans for automation. The NTIS also provides in-kind assistance to the PTO automation staff on occasion.

The Office for Productivity, Technology and Innovation (OPTI), headed by an Assistant Secretary of Commerce, was created to develop measures to improve the competitive position of the United States in world markets. The passage of legislation (P.L. 96-517) in 1980 provided non-profit organizations and small businesses with the first right of refusal to title in inventions made in performance of government contracts and grants. Authority to implement this policy was transferred to OPTI from the Office of Federal Procurement Policy of the Office of Management and Budget by P.L. 98-620. A Presidential memorandum issued in 1983 directed that agencies permit all contractors and grantees to take title in inventions to the extent permitted by law. Implementation of this directive is monitored by OPTI which works with agencies in their preparation of procurement regulations. OPTI is also developing policy to cover the ownership and the use of technical data arising from federally supported R&D. This is a highly controversial area with little precedent.

Domestic Enforcement

The government is not responsible for protecting the intellectual property rights of private individuals or corporations except for use of cable and non-profit television, jukeboxes and phonorecords. Individuals who believe their rights are infringed either must negotiate a settlement or institute a civil action in an appropriate court. Possible infringement is monitored by the individual owner of the property right or through use of such organizations as the ASCAP.

The Antitrust Division of the Department of Justice includes an Intellectual Property Section that monitors the interface between antitrust and intellectual property matters. The Section helps develop legislation with potential antitrust implications, such as the recently passed National Cooperative Research Act which removes certain antitrust barriers to cooperative R&D. The Administration's position is provided on matters before regulatory agencies and to the courts when the Administration's opinion on a pending case is requested. In order to assess antitrust implications, the Section participates in interagency efforts to standardize products for government procurement.

The Department of Justice represents the Patent and Trademark Office in a civil case when, for example, it is alleged that the agency acted improperly in approving or disapproving a patent application.

International Affairs and Trade

Advances in information technology often have worldwide implications. Piracy of intellectual property can pay handsomely and some countries have little to lose by not enforcing ownership rights.[21] Recent initiatives to reduce the United States trade deficit have linked trade policy to intellectual property.

> The Department of State's activities in the protection of intellectual property are carried out through its Office of Business Practices. State works with the World Intellectual Property Organization (WIPO) which centralizes the administration of certain unions or treaties for international patent, trademark and copyright protection. State facilitates U.S. participation in the Paris Convention for the Protection of Industrial Property and the Universal Copyright Convention. The Department initiates or participates in the clearance of papers circulated among agencies to achieve coordinated positions in multilateral and bilateral negotiations. To elicit outside advice, State has created an Advisory Committee on International Intellectual Property.
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> The Office of the United States Trade Representative (USTR), statutorily created in 1975 in the Executive Office of the President, is responsible for setting and administering trade policy. The Trade and Tariff Act of 1984 makes specific reference to the protection of intellectual property. The President is authorized to determine which developing countries can export goods to this country duty free, providing potential leverage in bilateral negotiations where intellectual property matters may be on the agenda. A statutorily required annual report to the Congress on trade problems is expected to have some influence on the practices of foreign countries in protecting intellectual property.
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> The United States International Trade Commission (ITC) is an independent quasi-judicial agency that determines whether unfair acts related to imports harm U.S. industries. Investigations often involve allegations of patent, trademark or copyright infringement. The intellectual property owner or licensee usually initiates action by making a complaint to ITC. The ITC may then conduct hearings before an administrative law judge. A final decision is rendered by the Commissioners. The agency is authorized to issue orders excluding goods from entry and/or a cease and desist order. Exclusion orders are enforced by the Bureau of Customs. ITC works closely with Commerce's International Trade Administration which maintains information on industries that might be harmed by unfair trade practices.

Policy Coordination

Responsibility for policy coordination with respect to intellectual property is mainly vested in four interagency committees, some affected by the recent reorganization of the White House policy machinery.

The Cabinet Council on Commerce and Trade is chaired by the Secretary of Commerce who has appointed the Commissioner of Patents and Trademarks as Chairman of its Working Group on Intellectual Property. The basic role of the Working Group is to coordinate the positions of federal agencies, especially in developing U.S. positions in foreign negotiations. Seven agencies of the Executive Branch are represented on the Working Group. The Copyright Office representative participates in the meetings, his position in the legislative branch currently posing no difficulties.

The Working Group is concerned with both international and domestic issues requiring a government-wide position. These have included (a) obtaining a coordinated position for the Brussels Satellite Convention subsequently approved by the Senate, (b) proposing controls for imports from third parties that degrade trademark protection, (c) recommending changes in the Freedom of Information Act to protect trade secrets, (d) coordinating agencies' positions on the recently passed semi-conductor chip legislation, and (e) assessing needed changes in the "first sale" doctrine that prevents copyright owners from obtaining royalties from rental of their properties.

The Trade Policy Committee is chaired by the United States Trade Representative and has a subcommittee on intellectual property chaired by USTR. It examines international protection of intellectual property as a trade barrier, in compliance with the Trade and Tariff Act of 1984. In trade matters the focus is on bilateral negotiations. Seven Executive Branch agencies are members of the subcommittee.

The subcommittee facilitates cooperation among agencies in carrying out responsibilities assigned to USTR as a result of the recent legislation. This includes (a) identifying the kinds of trade barriers that derogate from protection of intellectual property, (b) identifying the policies and practices of individual countries that cause serious problems in the United States, (c) compiling information in support of bilateral negotiations, and (d) preparing the annual report to the Congress that highlights problem areas and U.S. efforts underway.

The Senior Interagency Group on Communication and Information Policy is co-chaired by State and Commerce. Its Working Group on Copyright and Intellectual Property is chaired by a representative of Commerce's National Telecommunications and Information Administration. This Working Group is to coordinate agencies in developing U.S. positions on an issue such as protecting property rights in use of satellite communications. Six agencies, including the Copyright Office, are represented on the Working Group. A separate Working Group on Transborder Data Flow, chaired by State, coordinates U.S. positions in the OECD Committee on Information, Computer and Communication Policy.

The Working Group has been relatively inactive and indeed appears to have no clear role in achieving interagency coordination. Two meetings took place during the past four months for the purpose of keeping members up-to-date on developments affecting their respective agencies. Prior to that time a reorganization of NTIA created a hiatus that resulted in the Group not being convened. Work on the Brussels Satellite Convention that would seemingly be assigned to the Working Group was instead handled by the Working Group of the Cabinet Council on Commerce and Trade.

The Federal Coordinating Council for Science, Engineering, and Technology is chaired by the Director of the Office of Science and Technology Policy. Its Working Group on Intellectual Property is chaired by the Assistant Secretary of Commerce for Productivity, Technology and Innovation. This group addresses issues that arise in carrying out legislative and Presidential policy on ownership of intellectual property resulting from Government sponsored R&D. Nineteen agencies are represented on the Working Group.

This Working Group is used by the Assistant Secretary to facilitate coordination in carrying out responsibilities assigned to Commerce by P.L. 98-620. Guidance is provided agencies drafting Federal Acquisition Regulations that authorize vesting title to intellectual property in small businesses and non-profit organizations performing R&D for the government. Similar efforts are underway pursuant to the Presidential directive that encourages all government contractors and grantees to take title to the extent permitted by law. Guidance is being drafted for the disposition of technical data arising from government supported R&D. Also model agreements being prepared for use by government laboratories in undertaking cooperative efforts with private companies include provision for handling rights in intellectual property.

Collecting Societies

Introduction of new technologies in the early part of this century brought about a great increase in the number of users and the uses of creative works. Copyright owners found it increasingly difficult to control or administer their rights. Users also faced difficulties in identifying and remunerating creators of works. These problems led to a system of administering rights on a cooperative basis through collecting societies.

The music industry formed the first performing rights society in the United States. The American Society for Composers, Authors, and Publishers (ASCAP) served as a clearinghouse for nondramatic performing rights licensing, and as an agency to monitor performances and to police infringements. The broadcasters subsequently organized Broadcast Music Inc. (BMI). A third organization, the Society of European Stage Authors and Composers (SESAC, Inc.) encompasses American country and gospel music.

Revision of the U.S. Copyright law in 1976 resulted in establishing the concept of "fair use" in distributing copies of copyrighted works. Consequently, the Copyright Clearance Center was organized by the publishing industry to grant permission to and collect monies from users who wanted to make copies not covered by the "fair use" doctrine.

Functions, common to all United States collecting societies, include: (1) licensing users; (2) monitoring or surveying use; (3) remunerating collected payments to rights holders; (4) enforcing legal rights and policing infringers; (5) educating the public on the importance of protecting intellectual property; and (6) cooperating with foreign collecting societies.

Many other nations also use collecting societies to administer intellectual property rights. Currently there are over 100 collecting societies throughout the world, many nations making greater use of such private entities than does the United States.

Organizational Objectives

Technological innovation is critical to maintaining the health of this country's economy and to improving our competitive position in world markets. A recent report of the President's Commission on Industrial Competitiveness has stated: "In order to make technology a continuing competitive advantage for the United States, we need to do three basic things: (1) create a solid foundation of science and technology that is relevant to commercial uses; (2) apply advances in knowledge to commercial products and processes; and (3) protect intellectual property by strengthening patent, copyright, trademark, and trade secret protections."[22] This country is now collecting $5 billion annually more for patent rights, trademarks and copyrights than it pays out. However, the report noted that a wave of commercial counterfeiting, copyright, design infringement, and technology pirating is weakening this country's competitive position. Moreover, legitimate competition from abroad is increasing as demonstrated by patent data. In 1967, 20% of all patents issued by PTO were to residents of foreign countries, a figure that now stands at 42%.

A basic difficulty in managing the new information technologies is that criteria for according protection sometime no longer suffice. Such distinctions as "originality" and "authorship" are difficult to maintain in an electronic age. Enforcement is made more difficult here and abroad because these technologies are so generally available. Rights in intellectual property are being increasingly challenged by other "rights."

Support of technological innovation requires that discoveries receive patent or copyright protection within a reasonable period after application is made. This poses particular difficulties to the patent process which requires examination of the prior state of the art in the appropriate field of science and technology. A lengthy process of approval of patent applications can both deter the undertaking of technological development or require that inventors assume the risk of investment in commercialization without the certainty of protection of their ownership rights. They may find it expedient to proceed without divulging their inventions, maintaining trade secrets rather than expose information to public scrutiny. Especially during a period of rapid obsolescence of technology it is necessary to expedite the process for affording protection of patents or the system will not be used.

The above factors raise questions as to whether the government is doing all it can to anticipate developments and develop strategies for the future. It is not adequate to be in a reactive mode when technology is moving at such a pace.

Courts are by their nature reactive and without legislative guidance they have had to deal with complex areas of technology involved in litigation to provide intellectual property protection. In the Sony case Associate Justice Stevens stated, "Sound policy, as well as history, suuports our consistent deference to Congress when major technological innovations alter the market for copyrighted materials. Congress has the constitutional authority and the institutional ability to accommodate fully the varied permutations of competing interests that are inevitably implicated by such new technology."[23]

However, in accommodating the competing interests in the legislative process the Congress requires leadership from the executive branch. The subject of intellectual property rights is often highly technical and certainly is not high on the agenda of the Congress in addressing its legislative calendar. It is understandable that revision of the Copyright Act in 1976 took 22 years to be accomplished.

Executive branch organization must therefore be capable of providing policy leadership in the protection of intellectual property. Policy planning is required as well as operational planning. Strategies for the future must be charted to guide the course of legislation and adoption of agency policies.

Findings

1. All of those interviewed during the course of the study agreed that such problems as exist cannot be attributed to the present allocation of functions among executive agencies, the Copyright Office, and the Copyright Royalty Tribunal. Agencies have clear perceptions as to their respective responsibilities. There is a singular degree of interagency cooperation, with agencies assisting each other as needed. While the Patent and Trademark Office and the Copyright Office require little assistance from others in carrying out their operations, they willingly share their expertise with other agencies that sometimes are new to the field of intellectual property.

2. Conflicts result from conflicting and competing government objectives, not from deficiencies in organizational arrangements. There is an inevitable conflict between those who view intellectual property as a paramount natural right and those who believe such property rights, as other rights, must be weighed against and sometimes accommodated to other public purposes. Exclusivity conferred by a patent can restrict dissemination of information as envisioned by the First Amendment. Rights of privacy may be at issue when policing enforcement of copyright protection. The Freedom of Information Act may be invoked by those seeking access to scientific and technical data. Dorothy Nelkin has noted, "Indeed, the rhetoric of rights may be simply a way to elevate instrumental behavior to the level of moral imperative, leaving little room for negotiation and accommodation."[24]

3. The major problems facing the Patent and Trademark Office are long-standing and stem not from the introduction of new technologies, but from slowness in adapting management and administrative systems to cope with increasing workload. Progress is now being made as a result of income derived from sharply increased fees. The first step of automation is finally getting underway. The staff of patent examiners has been greatly augmented in recent years. However, there is currently a 27 month backlog of cases. The Grace Commission noted that the backlog of applications was 18.9 months in 1977.[25] While the ramifications of the large backlog of pending cases is not known, it is reasonable to assume that technological innovation is being adversely affected through delay in providing protection.

Congress and others have in the past attributed lack of support of the Patent and Trademark Office to actions or inaction by the parent department. Income from the higher fees now credited to a revolving fund has greatly augmented resources available to upgrade the agency's activities. While the $200 million program level for 1985 is over double what it was in 1980, the appropriation level is virtually unchanged. The staff of 3,300 full-time employees this year is about 25% greater than existed in 1980.

While the Patent and Trademark Office is far less dependent on appropriations, the personnel, procurement and other constraints remain burdensome in the view of the Acting Commissioner. His view is shared by many as described in the report of the National Academy of Public Administration, "Revitalizing Federal Management." Of particular concern is having to rely on Office of Personnel Management policies and procedures in the recruitment of scientific personnel, particularly in new fields such as biotechnology. Centrally controlled and protracted procedures for procurement of automated data equipment is also proving burdensome.

4. Introduction of new technologies has complicated, and in some cases, created problems in the protection of intellectual property abroad. Technology often can be employed in making copies at little cost. Some of the technologies protected by intellectual property, e.g., computer software, command large prices in the marketplace. Modern communications, such as signals from satellites, do not respect national boundaries. The extent of piracy abroad is appalling. The International Trade Commission estimates that American business loses almost $8 billion and 131,000 jobs annually through counterfeiting alone. Counterfeit goods entering the U.S. are being made in 43 countries. According to the Association of American Publishers, 27 major U.S. publishers had over 450 titles pirated in Taiwan in 1983. The Singapore government refuses to take an official stand against piracy.[26]

Problems that emerge require concerted action by a number of federal agencies in arriving at negotiating positions. Those interviewed believed that existing arrangements for negotiating international agreements and participating in international organizations are working reasonably well. There is concern with the inability of multilateral organizations to move quickly and decisively and to police practices of member countries, but this does not reflect on the nature of our participation. Each of the agencies concerned with intellectual property is being afforded an opportunity to participate in policy discussions and negotiations, often bilateral in character and linked to trade initiatives.

5. The Office of the U.S. Trade Representative appears to lack the resources required to provide leadership in linking protection of intellectual property to trade initiatives. Only one professional staff member, who chairs the interagency working group, is engaged full-time on intellectual property matters. The requirement for an annual report to the Congress on problems and progress in protection of intellectual property abroad cannot but distract from needed support of executive leadership. The adequacy of organizational arrangements needs particular attention because of authority provided the President to impose duties on commodities from countries that pirate U.S. intellectual property.

6. There is nowhere in government a planning staff that addresses the strategic issues of protecting intellectual property in an age of high technology. The Copyright Office has several policy advisers who assess problems that arise in domestic and international areas and recommend courses of action to the Register. The Patent and Trademark Office has a top level staff that advises the Commissioner on legislative and international issues. The mode is reactive to events rather than anticipatory, reflecting a belief that the patent and copyright laws are sufficiently broad to accommodate new technologies and that the ramifications of the new technologies cannot be anticipated in any case until litigation results.

7. It appears unsound to place primary reliance on interagency committees to develop policies for intellectual property. The fact that four of the top level committees have working groups for intellectual property indicates recognition of a problem area requiring attention. The issue is whether

committees can provide the vision, energy and constancy required to work effectively in such a rapidly changing and complex area of public policy.

While interagency committees are often necessary, their limitations are well known and often sharply expressed. A common complaint was voiced by Nelson Rockefeller who contended that interagency committees "reduce the level of government action to the least bold or imaginative—to the lowest common denominator among varying positions. In such circumstances, policy may be determined not for the sake of its rightness—but for the sake of agreement."[27]

A current perspective has been provided by Chester Newland in assessing this Administration's policy machinery. "Subjects and action taken by Cabinet Councils show that while they are of great importance, they are typically of a second order of policy." After listing agenda items, he went on to declare that "the Cabinet Councils deal with a list of matters that scarcely fit the term policy development; they are more concerned with facilitating implementation of agendas." While cabinet office involvement can move matters along, "the budging serves not to raise original or challenging inputs from subordinate experts in the agencies."[28]

Similarly, a review of agenda items of the four working groups concerned with intellectual property confirms that they are not raising original ideas or anticipating problems resulting from technological developments. Rather, their primary role is to facilitate interagency coordination in addressing problems and issues that have already surfaced.

8. Introduction of new technologies primarily creates problems for individuals and corporations in protecting their property rights. Consequently, intervention by the government in the operation of the free market raises serious policy questions. The government then must judge the relative worth of various forms of artistic and other endeavor in setting the price on the products. The process perforce becomes politicized. A system of setting royalty rates and licensing, comparable to that for jukeboxes, phonorecords, and cable and nonprofit television, would call for reevaluation of existing arrangements leading to the establishment of different administrative structures.

Past Reorganization Proposals

Previous proposals for improving the government organization for the protection of intellectual property have focused mainly on the Patent and Trademark Office.

The Patent and Trademark Office has for many years had a huge backlog of pending cases that has generated criticisms from the patent bar and others. The need for automation and additional staffing has long been recognized and inaction has been attributed to lack of support by the parent Department of Commerce.

The President's Commission on Economy and Efficiency in 1912 recommended that PTO have a building of its own and be subject only to supervision by the President. In the 96th Congress, S. 2079 and H.R. 6933 would have established PTO as an independent agency.[29] Past Commissioners have advocated that the Office be established as an independent agency. Legislative action has been taken to upgrade the Office within Commerce, the Commissioner being designated an Assistant Secretary in 1983.

Placement of the Copyright Office has rarely been addressed. However, an agency of the Congress created by that Act, the Copyright Royalty Tribunal, has been proposed for abolition. The agency has been subjected to severe criticism since its establishment in 1978. A former Chairman, Clarence James, told Congress that compulsory licensing should be abolished, statutes should be amended to provide a formula for collecting royalties, the CRT should be abolished, and needed functions transferred to the Department of Commerce. He declared that compulsory licensing interfered with artistic and economic freedom and "constitutes an imappropriate interference with the traditional functioning of the copyright system" so "let the parties use the marketplace." A former Register of Copyrights, David Ladd, recommended that cable television be entirely deregulated, permitting the industry and copyright holders to freely negotiate royalty payments. Congressional opposition to adding staff to CRT results in an agency with a total staff of four.[30] Because of its miniscule size and limited role the existence of the agency has until recently drawn little attention.

The report of the President's Commission on Industrial Competitiveness proposed creation of a Department of Trade and a Department of Science and Technology.[31] The Administration has considered proposing establishment of a Department of Commerce and Trade but has not gone forward with such a reorganization. Any such reorganization would not affect the placement of the Patent and Trademark Office.

Alternative Approaches to Improving Present Organization

While operational coordination of federal activities is working well in the protection of intellectual property, benefits might be realized from selective reorganizations. The advantages and disadvantages of any realinements should be carefully weighed before tampering with the existing structure.

Options for reorganization range from a major realignment of functions to modest measures. In most cases legislative action would be required.

Alternative Approaches	Action Required
o Consolidate Patent Trademark Office and Copyright Office	Legislation
o Abolish Copyright Royalty Tribunal	Legislation
o Establish Patent and Trademark Office as Corporation	Legislation
o Establish Administrative Agency	Legislation
o Strengthen U.S. Trade Representative	Administrative
o Create Policy Planning Capability	Executive Order

Consolidate Patent and Trademark Office and Copyright Office

The Patent and Trademark Office and Copyright Office could be brought together in the executive branch under a single head. Development of policies with respect to intellectual property necessarily involves consideration of both patents and copyrights. The Copyright Office is not integral to the Library of Congress and is engaging in licensing functions that are questionable in the legislative branch. As copyright matters loom larger in trade negotiations the Copyright Office will be drawn further into the ambit of decisionmaking in the executive branch. For this reason, an association representing patent, trademark and copyright owners, Intellectual Property Owners, Inc., believes consideration should be given to placing the Copyright Office in the executive branch.

The major difficulty of effecting such a consolidation is clearly political. The Copyright Office has been in the Library of Congress for over a century.

Arguments for transfer appear abstract and legalistic in the absence of demonstrated problems in its present location. Few operational advantages would result from placing the two agencies together because their processes are so different that there would be little integration of staff.

Abolish Copyright Royalty Tribunal

This agency is an organizational anomaly that raises basic policy as well as organizational questions. Such a body may not be needed to set rates and distribute royalty deposits to claimants. Copyright holders and users may be able to negotiate royalties now handled by the agency, as indeed they now do in other areas. A basic policy question to be resolved is whether it is appropriate for government to be an intermediary in settling claims among private parties.

What can be accomplished by the private sector in protection of intellectual property is exemplified by ASCAP. That instrumentality has created a clearinghouse for central administration of owners' rights. Users can obtain a blanket license to use any of the registered works. Royalties are collected and paid to rights holders. ASCAP facilitates negotiations between various interested parties, enforces legal rights and polices infringement.

If the function needs to be carried out by government the existing arrangements are clearly faulty. The Copyright Royalty Tribunal lacks staff to perform its tasks and must perforce sometimes act arbitrarily in the absence of economic and other analyses. The separation of licensing from other regulatory functions has created difficulties. If the quasi-judicial functions of the agency are necessary and are to be accomplished in the legislative branch they might be vested in the Copyright Office through use of administrative judges or other means. One practitioner of intellectual property law has proposed creation of a single regulatory agency with all-encompassing jurisdiction over copyright matters.[32]

Establish Patent and Trademark Office as Corporation

Establishment of the Patent and Trademark Office as a government corporation would provide operating and financial flexibility to cope effectively with the increasing workload. A corporation could borrow if appropriate to finance the initial high costs of automation. It could support research, not only to improve program operations but also to help guide policy formulation within government. Users of patent and trademark services, who have shown a capacity to adjust to increased fees, would receive better services. As a corporation, PTO would have the resources necessary to meet its needs and would not be subject to limitations on personnel and other restrictions which have hampered the agency in the past. Such a corporation should be subject to the direction and supervision of the Secretary of Commerce and existing relationships with the department would not be disturbed.

A corporation might include the Copyright Office as well as the Patent and Trademark Office, placing responsibility for administering laws that protect intellectual property within a single organization. This would resolve the anomaly of a legislative agency carrying out executive functions, including those of a regulatory nature. The Copyright Office would be able to exert greater leadership in international negotiations as a member of the executive branch. Certainly, placement of the Copyright Office within a new corporation would be politically more palatable than consolidation with an existing agency.

Establish New Administrative Agency

If the government should assume major mediating responsibilities rather than rely on owners and users of intellectual property to negotiate agreements in the marketplace, an organizational option that would need to be considered would be establishments of a new administrative agency in the executive branch. The agency would be assigned the licensing and royalty collection functions currently being carried out by the Copyright Office. The fee setting and adjudication functions of the Copyright Royalty Tribunal would also be vested in such a new agency.

It is doubtful that such an agency should be created as an independent agency of the executive branch. Rather, it would more properly be constituted as a unit of the Department of Commerce which has a number of other units concerned with intellectual property matters. If so placed, functions should not be merely added to the Patent and Trademark Office; rather, a new entity should be created so the organization conforms with the mode of operations required to carry out the new responsibilities.

Strengthen USTR

The dimensions of the piracy problem abroad and the new authority provided the President on trade matters warrant that consideration be given to establishment of the post of Assistant U.S. Trade Representative for Intellectual Property. Such a position would provide more top level attention to this aspect of international trade, within the councils of government and in negotiations with foreign countries. Such an official could chair the Working Group, upgrading that body. Increased attention to intellectual property in the trade area would clearly require augmentation of staff of the Office of the U.S. Trade Representative.

Create Policy Planning Capability

Because new technologies are impacting many of the established "rights" and institutions in this country there is a need to set broad perspectives in policy planning. Conventional ideas for protection of intellectual property need to be critically assessed in the light of new developments. The appropriate respective roles of the government and private sectors need to be assessed. Current institutional arrangements which place such a complex load on the courts to decide policy should be evaluated.

Several options should be considered for placement of any policy planning function. The most obvious alternative is to assign the function to a constituent of the Executive Office of the President. However, experience has amply demonstrated that the imprimatur of the Executive Office is often of little value in asserting leadership in a program area. Agencies know what has the President's attention and act accordingly. "Washington is highly sophisticated in distinguishing between courtiers and members of the privy council."[33]

Problem analysis and policy development require the commitment of staff resources hard to come by in the Executive Office. The specialization often required would not conform with the mode of operation of the generalists who serve the President.

Among line departments and agencies the Department of Commerce currently has the major role in protection of intellectual property. Top policy officials of the Department can call upon a broad-range of technical resources in their six agencies and offices with significant activities in the protection of intellectual property.

Policy planning requires a strong analytic capability to assess the implications of new technologies on our economic and social framework. Such planning calls for a high order of informed objectivity and a willingness to address controversial issues. In strengthening the policy management process it is desirable to examine the potential of the National Academy of Sciences and its machinery. The Academy, which operates under a Congressional charter, has a Commission on Sociotechnical Systems whose purpose is to assume responsibility "for those areas within the National Research Council concerned with large-scale physical, technological, and industrial systems that are employed in the public and private sectors to serve societal needs." The Transportation Research Board exemplifies the mode being followed by the Academy, assembling participants from every sector of the socio-technical system in a continuing appraisal and planning process that considers the benefits and costs to society of alternative approaches.

The Commission on Sociotechnical Systems has no unit that addresses information and communications technologies from the systems standpoint and perspective. Yet, it is evident that the impacts on society deriving from the communications revolution are pervasive, evolving, and growing. Communications comprise a major sociotechnical system that is transforming society. If agreement could be reached between the government and the National Academy of Sciences, a significant new analytic element could be created to amplify the knowledge base to address intellectual property issues with greater lead-time and coherence.

Consequently, it appears sound for the President to issue an executive order making the Secretary of Commerce responsible for coordinating policy planning within the executive branch. The Secretary could delegate responsibility to a top policy official and assure provision of the necessary staff support. Existing arrangements for participation by the Copyright Office should be continued.

The official designated by the President to undertake policy planning should explore with the National Academy of Sciences the feasibility of obtaining support in a systems approach to intellectual property. If the Secretary of Commerce were so designated, the Department could provide core funding of the Academy's work. Through enlisting the various interests involved in this area, the Academy could serve its traditional role of providing a buffer for government in controversial areas of public policy.

Conclusion

The President and the Congress need to consider the policy implications, before considering the possible options for improving existing organizational arrangements for the protection of intellectual property. Organizational arrangements are not neutral. In our choice of organizations we inevitably give some interests and perspectives greater emphasis than others. The basic question that needs to be answered is the degree of priority to be given to protection of intellectual property as opposed to competing government objectives and societal interests.

In its attempts to accomodate new technologies, the present system for protection of intellectual property is undergoing some strains. While it is evident that improvements are necessary and desirable, these do not call for a fundamental change in the system or in the present assignment of organizational responsibilities. A number of organizational options were explored which we believe merit consideration by the Congress and the President.

FOOTNOTES

1 "Patent 'property' is almost an abstraction, consisting solely of a right to exclude...That is all it is." Robert J. Hoerner, Antitrust Law Journal, ABA, 1985, p. 655.

2 Allen Kent and Harold Lancour (Eds.), Copyright: Current Viewpoints on History, Laws, Legislation, Bowker, 1972.

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4 Lloyd M. Short, The Development of National Administration Organization in the United States, Johns Hopkins, 1923; also, Department of Commerce publication, "The Story of the United Patent Office," GPO, January, 1972.

5 Benjamin Kaplan, An Unhurried View of Copyright, Columbia U., 1967, p. 82.

6 D. Lacey, "The Quagmire," Saturday Review, Nov. 27, 1971, p. 24.

7 Aubert J. Clark, The Movement for International Copyright in Nineteenth Century America, Greenwood, 1960, p. 182.

8 From a report to OTA, "The Accommodation of Intellectual Property Law to the Introduction of New Technologies," 1985, p. 8.

9 "A major effect of technological change is that it causes ambiguities in some of the definitions of property rights that may have seemed perfectly clear before the change," Roy G. Saltman, "Copyright in Computer-Readable Works," NBS, October 1977, p. 5.

10 See "Annual Report of the Register of Copyrights," GPO, 1983, 1984, pp. 3-4.

11 A former Register of Copyrights, Barbara Ringer, noted, "Computer systems can contain millions of works that are forms of artistic expression. Systems can be linked throughout world, viewing screens everywhere including homes. Can obtain a copy by pressing a button." George P. Bush, Technology and Copyright, Lomond Systems, 1972, p. 297.

12 See P.O. 94-549. Communications Act Provisions for Earth Stations.

13 For a discussion of these problems, see Christopher Burns, Inc., The Economics of Information, an unpublished contract report prepared for the Office of Technology Assessment, 1985.

14 Stan Besen, Economic Issues Relating to New Technologies and Intellectual Property, unpublished report prepared for the OTA, February 1985, pp. 44-55.

15 The 1980 Amendments to the 1976 Copyright Act, for example, specifically included computer programs, data bases, and works created by the use of computers within the realm of copyright protection. Most of the remaining issues were resolved with the court case, Apple Computer Inc. v. Franklin Computer Corporation, in which the Third Circuit Court of Appeals held that computer programs, whether in object or in source code, whether written or embedded in ROM, and whether an applications program or an operating systems program, are "literary works" within the meaning of the 1976 Copyright Act, and hence subject to copyright protection.

This is not to say that there are no alternative views about this decision. See, for example, Pamela Samuelson, "CONTU Revisited: The Case Against Copyright Protection for Computer Programs in Machine-Readable Form," Reprinted from Duke Law Journal, vol. 1984, No. 4.

16 Leon Seltzer, Exemptions and Fair Use in Copyright: The Exclusive Rights Tensions in 1976 Copyright Act, Harvard University Press, 1978, p. 12.

17 Simon Nora and Alain Minc, The Computerization of Society, Cambridge, MIT Press, 1980.

18 See OTA, Computer-Based National Information Systems, Technology and Public Policy Issues, September 1981; and OTA, Staff Memorandum, Institutional Options for Addressing Information Policy Issues: A Preliminary Framework for Analyzing the Choices, November 1983. For other discussions and characterizations of the Information Society, see, for example, Susan Artandi, "Man, Information, and Society: New Patterns of Interaction," Journal of the American Society for Information Science, January 1979; and Daniel Bell, The Coming of Post Industrial Society, Basic Books, 1973.

19 William S. Strong, The Copyright Book, MIT, 1981.

20 President's Private Sector Survey on Cost Control, "Report on the Department of Commerce," GPO, 1983, p. 24.

21 See Senate Judiciary Committee Hearing, "Oversight on International Copyrights," Serial No. J-98-142, GPO, 1985.

22 "Global Competition, the New Reality," Vol. I., GPO, 1985, p. 18.

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25 President's Private Sector Survey on Cost Control, Op cit, p. 73.

26 "Global Competition," Op Cit. Volume II, Appendix D.

27 Harold Seidman, Politics, Position and Power, Oxford, 1970, p. 172.

[28] The Reagan Presidency and the Governing of America, Urban Institute, Washington, D.C., 1984, pp. 154-60.

[29] See House Report No. 96-1307, Part 2, September 23, 1980.

[30] Senate Committee on Appropriations, "Legislative Branch Appropriations," 1982, pp. 644-646 and pp. 673-678. Also, see Margaret Carlson, "Where MGM, the NCAA, and Jerry Falwell Fight for Cash," Fortune, Jan. 23, 1984, p. 169.

[31] "Global Competition, the New Reality," Op cit. Vol. I, p. 41.

[32] Daniel Toohey, "The Only Copyright Law We Need," Wilson Library Bulletin, Sept. 1984, p. 28.

[33] Seidman, op. cit., pp. 211-15.

NATIONAL ACADEMY OF PUBLIC ADMINISTRATION

Intellectual Property Rights in an Age of Electronics and Information

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INTELLECTUAL PROPERTY RIGHTS
IN AN AGE OF
ELECTRONICS AND INFORMATION

FINAL REPORT

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SECTION 1
BACKGROUND

1.1 Definition of Information

What is information?

Information is an elusive concept. Most of us understand what information is, yet few of us would agree on a definition of information. Scholars and philosophers have discussed information at great length yet a single definition still eludes us. Various perspectives on what information is exist, ranging among information as a phenomenon, as a process, as an event, as a spectrum, etc. For the purposes of this report we will use the following operational definition of information as our starting point without discussing potential alternatives to, nor the implications of, this particular definition. The definition of information we propose to use is:

Information is recorded messages that convey meaning to both the creators and intended users of the messages.

It is important that we include only recorded messages as information service organizations and information professionals are only concerned with information that is recorded for storage and future retrieval by others. We also include only messages that convey meaning to eliminate recorded "noise".

Information Content Versus Information Form

In studying and handling information, a distinction can be made between the content of the information and its form. The content of information is the meaning of the message. The form of information is the vehicle by which the meaning is conveyed, or packaging of the message. In addition to the basic distinction between content and form, one can identify three aspects of form: format, structure and medium. Information format involves the type of information — textual, numeric, coded, pictorial, graphic, photographic, etc. The same information content can be expressed or conveyed in one of the several alternative formats. For example, a table of numbers can also be expressed in graphic format or in textual format.

The second aspect of form is structure. This involves the detail of the expression of information content and includes the specific language used for textual information, the syntactical and semantic structures used, or the expression of numeric information contained in tables, in pie charts, bar charts or graphs, etc.

The third aspect of form is the medium in which the information is captured and includes paper, microform, electronic, magnetic media, etc. which carries the information through all processes from creation to use.

This distinction between information content and the three components of form is important for a number of reasons. The functions that can be performed on information to make it available to the intended users can be divided into those that are concerned with content and those that are concerned with the three aspects of form. The technologies that are used to support various functions also break down in this way, as do the economic considerations. This distinction is particularly important from the perspective of intellectual property. Issues relate to either the intended meaning conveyed — the intellectual constructs, the creative process, the products of the intellectual activities — or to the expression of that meaning — the way it is presented, the exact format used. The information content has a certain value to both creator and user, but the information expression adds to that value in some way, as do various functions related to the packaging of the information product. Each participant in the provision of information has some interest in an information package and is concerned about protecting that interest.

Primary Versus Secondary Information

In this report we define primary information as information content that is created by humans to describe objects or events or that results from intellectual effort such as in solving a problem or creating an invention. Primary information may be used for many purposes such as being informed, making decisions, doing research or being entertained. Intellectual property is usually primary information that is recorded in books, articles or some other medium. Secondary information is defined as information about primary information. It is usually used to gain access to primary information. Examples of secondary information include catalog entries used for organizing and controlling stored primary information or abstracts and indexes used for searching for primary information. Another kind of secondary information is synopses of primary information found in state-of-the-art reviews. Analysis of recorded primary information is often referred to as secondary research. Recorded secondary information is also sometimes considered intellectual property as well and there is currently a great deal of concern about protection of secondary information content or form.

1.2 A Framework for Discussing Intellectual Property

One problem in discussing an information concept such as intellectual property is the enormous size and complexity of the information environment. Too often information policies and legislation are developed which appear to make sense generally, but when considered for individual situations simply do not apply. For this reason we have attempted to provide a framework or structure which classifies the information environment into categories that have particular meaning for intellectual property, in terms of how it is now viewed or might be viewed in the future. One dimension of this structure is subdivision of information into content and form. We feel that much of the confusion with intellectual property and legal aspects of ownership such as patents and copyright, relates to this distinction. Creativity is associated with information content, and ownership of the content must be recognized and preserved or incentives to create new intellectual works will be diminished. Ownership is often equated with expression or format and structure of information. Yet, ownership of intellectual property is often transferred to other participants such as publishers so they can add value to information by processing or changing the information form. These participants "require" the ownership to protect their investment in terms of risks taken and to cover the costs incurred in processing the information form. Otherwise their incentives to do so would be lost.

Below we discuss the information environment in terms of the extensive information needs of our society and the information requirements necessary to fully satisfy these needs. The needs extend from information used for meeting personal needs, life-long learning, performing work and governing our society to conducting international relations. These needs often cannot be met without satisfying certain information requirements. Such information requirements include information attributes such as accuracy, precision, currency and availability of information content and accessibility, speed of delivery and quality of information form. Each individual need is unique in terms of what specific attributes are required. Because of this an entire information community has evolved to perform certain functions necessary to meet all the needs and satisfy the requirements as well as possible under various economic constraints.

Information Needs

Information is a dominant force in our lives. In the U.S. an enormous amount of information is communicated in the form of words through formal media. In the 1970's, it was estimated [de Sola Pool, et. al., 1984] that the population consumed about 8.7 trillion words each day through electronic media such as radio and television and print media such as newspapers, books and magazines. The average number of words consumed per person is actually increasing at a rate of 1.2 percent per year. Despite problems of literacy and the competition from the electronic media, the number of words consumed from the print media is remaining constant over time. Information, in all forms, is essential to all facets of our lives; whether meeting personal needs, through life-long learning, in accomplishing work or governing society.

Information is the principal resource used for meeting all our personal needs such as in keeping informed; coping with day-to-day problems; dealing with life's traumas and crises; supporting religion, family life and cultural heritage; and in accommodating our recreation, entertainment and leisure time activities. Never in history have we had the opportunity to be so fully informed about up-to-date world, national and local news events. Every day individuals make hundreds of information-based decisions to cope with such day-to-day activities and problems as: shop ping; maintaining health; preventing accidents, fire or theft; travelling; or determining information about the weather, road conditions or pollution alerts. Information is essential in dealing with personal money matters such as budgeting, paying bills, paying taxes, investments, retirement and estate planning. Throughout our lives we are also faced from time to time with trauma and crises which must be met such as: serious illness; fire, accidents or other emergencies; death of relatives or friends; divorce, loss of job, and drug or alcohol addiction. Obviously, a large share of our entertainment, recreation and leisure activities is dependent on information.

Information is also the essential to life-long learning, from pre-school through formal education and continuing through our worklife and on into retirement years. A widely distributed report by the National Commission on Excellence in Education, A Nation at Risk: The Imperative for Educational Reform [1983], stressed the theme of a learning society and life-long learning and emphasized the importance of knowledge, learning, information and skilled intelligence as the essential raw materials for the future. The request stated that learning is an indispensable investment required for success in the "Information Age" we are entering. Learning is the aboutness of information. Without information, regardless of form, one cannot learn. This is probably why Secretary Bell in his foreword to a response to the report [1984] stated that libraries, as well as schools and the home, form the three essential platforms for learning.

Regardless of the kind of work one does, information plays an important role. In factories, information is becomming an essential component of manufacturing processes. The flow of information to and from production lines is now recognized as essential to quality of products. Most office work involves creation, processing and use of information. Service industries such as restaurants, stores and entertainment depend greatly on information concerning which products to buy, merchandise, sell and advertise. Many service industries are, in fact, probably better classified as information industries. For example, such industries include movies, publishing and retailers that distribute information materials such as book stores, news dealers and newsstands, and information products such as radio and television stores, camera stores, and calculator stores.

Successful farming is virtually impossible without information concerning crops, livestock handling, soil conservation, crop yields, weather, commodities market results, and so on.

Another aspect of our lives that is heavily dependent on information is governing societies. In democratic societies, citizens must be well informed about issues, candidates for office and local voting issues such as bond issues. They have ample opportunity to become informed through the electronic and print media, campaign brochures and information found in libraries. One important function of governments is to generate and provide information about their countries or local jurisdictions. In the U.S., federal, state and local governments spend billions of dollars on collecting information which describes the population, business, labor, education, health care, housing, transportation, the environment, weather, and geographics or almost all aspects of our lives and factors that affect them. This information is used not only to help legislate and govern, but it is also used extensively by businesses and researchers. Information is also collected so that governments can carry out their responsibilities in such areas as providing public services, conducting or sponsoring research, formulating regulations and laws, law enforcement, national defense and intelligence. It is hard to imagine that any of these governmental functions could be adequately carried out without information. Most of the government's business is information.

The keystone of international understanding and cooperation is information. Surely, the principal hope for world peace is the communication of information. The greatest source of suspicion and recent tensions between nations is partially the result of inadequate communication. International trade could not take place without information since there would be no knowledge of needs, available products and services, and means of transporting goods. One of the most puzzling contemporary problems in international affairs deals with the undesired transborder flow of information. The U.S. in particular in recent years has been concerned with ideas, scientific results and information about new technology developed in the U.S. being obtained and used by countries that compete in the marketplace for consumer durables and other goods and services. Much of the effort to help lesser developed nations has revolved around information about health care, farming methods, manufacturing processes, and science.

Information Requirements

Above we pointed out that we consume an enormous amount of information. There is even more information in latent form that is made available to us but is not used. For example, in one year there are between 100,000 trillion and one million trillion words made available in both radio and television each year. Newspapers make available about 10,000 trillion words, magazines 2,000 trillion words, books 800 trillion words and so on. The growth of words made available (8.9% per year) is substantially greater than our ability to consume them (2.9% growth per year). This has contributed to what is variously called an "information glut" or "the information explosion." [Pool, et al 1984]. For this and other reasons, information has to be processed to provide it in a useful form, in the appropriate quantities and at the time required.

In an ideal information environment, several requirements regarding information attributes would be achieved. For example, information content and form would always be:

- accurate (that is, events or created information would be factually described, with the correct meaning both sent and received);
- precise or provided in the right dosage (that is, the precise amount of information would always be conveyed -no more, no less);
- available in the required form (that is, in the format, structure and medium required);
- available at the time needed (that is, the currency of information is appropriate and the required speed of delivery after a need has arisen is achieved); and
- accessible where needed (that is, in the home, at work, etc.),

Every single use of information has a unique set of requirements for specific attributes. News must be accurate and current for it to be useful. Sometimes when we get news, we only want to know the essential facts about a situation or event and other times we are deeply interested in the details behind a story. An evening newscast on television may simply not provide enough information (i.e., be too precise), so we still rely on newspapers and magazines to provide backup information. Yet, we do not read all the information in newspapers, magazines or journals. Thus, these media are not precise as far as specific user needs are concerned. For example, scientists read only about one out of ten articles sent to them through journals. In emergency situations, for another example, in order to treat someone following an accident or poisioning, we immediately need accurate, but only the essential information on how to treat the trauma and not the theory behind the treatment. When information irrelevant to a specific need is communicated, the unwanted part is referred to as noise. The degree to which noise is reduced is precision.

There are also several key attributes of information format and structure that are necessary if information is to be used and useful. These attributes vary in their importance, depending on the information needs. One information requirement is that it be conveyed in an information form that is **meaningful** and **useful**. A useful format must be comprehensible to both the creator and user. Scientific information provided in highly technical terminology, mathematical equations or chemical structures would be useless to the layman. Another format attribute is the language in which the information content is written or spoken. Obviously, the language of the creator and user must match or assimilation cannot take place. There is even some difficulty in communicating information across fields of science because of special terminology (or jargon). For example, stress has entirely different meanings in psychology and metallurgy; program means something different to a computer scientist and a public administrator. Masses of numeric data have little meaning unless summarized or described in terms of proportions, averages, totals and so forth.

There are several attributes of medium that are required to make information useful. One such attribute involves the currency of information which is the time that information is needed following its creation.

In some cases, such as "news", the information is most useful (and even most valuable) a short time after an event has occurred. In other instances, the need for information may not arise until months or even years after information has been created. Scientific, medical, legal and other information used by professionals are cases in point. A medical doctor, for example, may need information for diagnosis or treatment of rare diseases only once or twice in a career.

Another attribute of medium is the timeliness or the **speed** with which information must be obtained after the need for it has arisen. Scientists, for example, sometimes need information within a few days after its need has been determined in an experiment; other times a delay of weeks would not hurt because use of the information can be scheduled in with other events. Information on diagnosis and treatment of an injury or disease may be needed very quickly. Novels or information about recreation probably does not require fast access. Yet, information about an airline schedule in an airport may need to be obtained within minutes for it to be useful. Information in commodity markets often requires even more speed.

Another attribute of medium is accessibility. An example of accessibility is that information be communicated in a **medium** that can be received and assimilated by the users. It does little good to communicate via an electronic medium if the user does not have an electronic receiver such as a telephone, radio, television set, terminal, telefacsimile receiver or whatever. These media accommodate communication when speed is important and/or frequency of use is very high. People are accustomed to getting information from books, magazines, newspapers, etc. In fact, people like, and even prefer, to read while travelling (look around on an airplane), in an office or at school. Communication through sensory media is sometimes necessary too. For example, blind people must rely heavily on sound and touch.

Accessibility also involves **space** or **distance**. Obviously, ability to communicate information over distances came slowly to humans, because initially the communication was limited to sight and sound. The distance constraint was first overcome by human travel, smoke signals, drum signals, and the like. Electronic transmission destroyed the barriers of distance as well as speed of transmission. However, another aspect of space or distance is that information be made available at (or near) the users' location (or users' desired location) such as at home, the office, or some other place. If one has to go too far to get information, it simply may not be worthwhile. Visits to libraries by scientists, for example, drops dramatically, if the "distance" to the library is over ten minutes. However, they can still get the needed information through other means. There is merely a trade-off between the value of information and the cost necessary to get it.

1.3 Economics of Information

An ideal situation exists from the perspective of economics of information as well as for information requirements. For example, an ideal environment would be if, for every information need and set of requirements, the user could and would pay exactly the amount of value that information and its attributes have for a specific purpose of use. In such a situation, creators would be compensated for the value of the information and other participants would be compensated for the value added by services that satisfy specific information requirements. There are many reasons that such an ideal economic situation does not and cannot happen. The value of specific information needs and requirements can vary substantially among users, and even for an individual at different times. Information suppliers must set their price at a level that will achieve sufficient demand to make a profit (or just cover costs in some instances). For some information services such as television and radio broadcasting, users are not even charged directly. Information products such as newspapers, magazines and scholarly journals come reasonably close to charging for individual readings in that subscribers pay for at least the portion they read of information sent to them. However, the value derived by the reader of the different information read varies substantially.

The trend in information transfer is for there to be more and more participants and/or technology options between the creator and end-user of information. This trend has the effect of providing more needed information and better information service attributes. It also means, for the most part, that users are more likely to pay for specific information and the value-added processes so that we are coming closer to the ideal economic situation mentioned above. On the other hand, it also means that the creators may not be adequately rewarded, since there are so many new participants in the information transfer process that share in the revenues created through purchase of information products and services. Technology may provide an answer to the latter problem. Before this is discussed, we first describe three important aspects of the economics of information.

Three Aspects of the Economics of Information

One very important aspect of the economics of information is the **frequency** with which information is used. Some information is extensively used, such as the news about an election result or the start of a war. Other information can be used, perhaps, only once or very infrequently such as a personal conversation or information in a personal letter. Some scientific information can be understood or has meaning only to a handful of scientists in a discipline. In other instances, some scientific articles or books may be read hundreds of thousands of times. Scholarly information has a widely varying amount of use. A small amount of information accounts for a major portion of reading. In fact, there is a rule of thumb which says that 20 percent of scholarly materials (such as articles) accounts for 80 percent of the reading. This does not necessarily mean that the infrequently read articles are not important; it may simply be that they have limited audiences who can read, understand and use the information.

There are several reasons that frequency of use of information is important. From the supplier perspective, information services and products often involve large input costs. Thus, there is a financial risk involved with incurring these costs and there has to be a large amount of use to reduce the cost per use, and hence price, to a level users can afford. There are ways that this problem is overcome. For example, publishers "bundle" articles together to increase use of issues. This also has the beneficial effect of providing an outlet for infrequently read, but highly valuable articles. Users must also decide whether the value of a single use (in the case of a book) or multiple use (in the case of journal issues) justifies the cost over getting the information in alternate ways.

Similarly, libraries need to have multiple uses to justify purchasing versus borrowing materials. The information business is fraught with decisions on supplying or purchasing based on frequency of use.

Information used also has **value.** The amount of the value of specific information depends on the purpose of use, amount of use, the person who is assessing the value of information when deciding to use it and the point in time that one determines value. Clearly, the value of information for the many types of uses mentioned earlier varies substantially. Information that leads a scientist to a cure of a major disease has more value than information about the results of a sporting event. The value of educational information is of some value to each student, perhaps to at least pass required tests. However, the value to society derived from education is substantially greater because the information maybe conveyed, assimilated and used in life many times by the student as well as the collection of all students who get the information.

The "cost" of information is also an important aspect of the economics of information. By cost, we mean more than the price of, or monies exchanged for, information (e.g., the price of a book, tuition fee for education, the price of a movie, etc.). One must consider all the costs associated with creating, processing and using information. All these costs are included in the "price" paid, sometimes in very subtle ways. For example, the cost of transmitting information by major network television is very inexpensive on a per word transmitted basis and so we do not pay for the transmission. We do pay for the reception, however, in terms of the cost of the television set and, much more important, our time spent viewing. The "price" we pay is in the lost, perhaps more useful things that we might have done with that time. Another "price" we may pay is through being subjected to advertising (although advertising often conveys useful information about products). Advertisers, of course, pay for most of the creation and network broadcasting activities and the cost is recovered in the price of the products advertised.

In some ways it is easier to assess the value and cost of information used by scientists, lawyers, educators, doctors, and other professionals because their time is a scarce resource and how they choose to use that time, such as for reading information, is an indication of the value of the information read. The purposes for which they use information are also easier to ascertain and the outcomes of their use of information can be measured, although not easily. For example, professionals have indicated whether reading and using information saves them time in terms of not having to generate the information themselves, winning a trial or in avoiding a fine due to regulations, and so forth. Similar attempts have also been made to determine the value of education by determining how much individual salaries or personal income increases as a result of educational achievement.

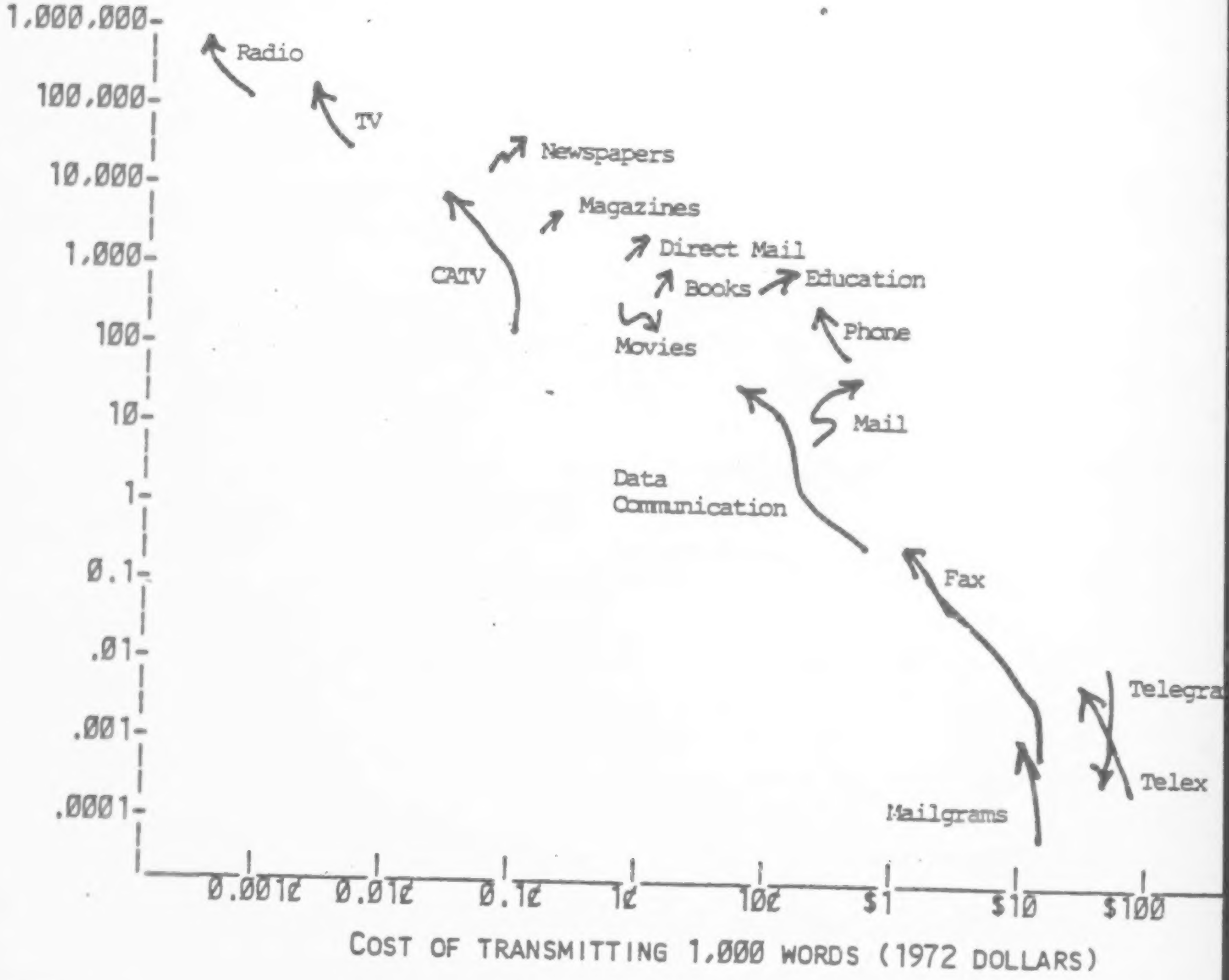
Micro-economic Implications of Information

Above we indicated that there are three important economic attributes of information: frequency of information need, cost and value. In more common economic terms the frequency of information need is the quantity component of demand for information. Both demand and supply depend on the inherent quantity of information demanded. The quantity of information demanded by information consumers is dependent on their perception of the value derived from information and price required for information. The quantity of information supplied is dependent on the relative revenue and cost of generating and providing the information.

Pool, et al have provided a useful portrayal of the supply and the average cost of information as measured by words (Figure 1). Generally, there is an inverse relation between amount of words supplied and cost per word transmitted, although in some media the average costs (in constant dollars) have risen over time. For example, over time the average cost of words transmitted in recorded media have generally increased whereas the average cost of words transmitted in electronic media have generally decreased. The "efficiency" of the mass media appears to be opposite in that the electronic media appear to have many fewer words consumed as a proportion of words supplied when compared to the recorded, non-electronic media. In the U.S. in 1980 the proportion of words consumed to words supplied is 0.1 percent, 0.9 percent and 0.7 percent for radio, television

Figure 1

VOLUME AND COSTS OF COMMUNICATION BY MEDIA



SOURCE: COMMUNICATION FLOWS, POOL, ET AL., 1984.

and CATV respectively. Whereas, with movies, newspapers, magazines and books the efficiencies are 11 percent, two percent, five percent and about 35 percent respectively.

Embedded in the information environment is a series of demand and supply decisions that have resulted in the existing supply and consumption of information. New kinds of suppliers are continually evolving to create and to process information to make it more valuable by meeting the plethora of user needs and requirements. In considering both the demand and supply, it is important to distinguish between information content and information form. Value is derived by users from both content and form. Value is derived from information content by how it is used, that is, by what information needs are satisfied and the consequences of having consumed information contents. Value is derived from information form through the ways in which information is obtained and the degree to which information requirements are met. Information users must constantly make choices of whether to acquire and consume information based on its price and value.

The price that people pay for information is an indication of the value they place on the information. Studies by King Research [1,2,3] involving use of scientific and technical information suggest that the "price" of the information content is largely determined by the scientist's time spent reading and assimilating the information. Whereas, one might think of the "price" users pay for information form (i.e., format, structure, and medium) as being some portion of the "price" paid in monies exchanged for the medium (e.g., journal or book) plus the time spent in gaining access to the information. Generally speaking, looked at in this way, the value of information content is roughly five to ten times greater than that of the value of information form. Of course, in a free market the price charged for information is often decreased in order to meet competition. In terms of the consequences of reading and using information, it is found that value in terms of savings* derived from using scientific information content is roughly another order of magnitude higher than the value determined by "price" paid for content and form. One method of determining the value of information services and products (which mostly involves information form) is to determine what would happen if the information services were not available. For example, if a scientist's company (or agency) library were not available, the additional price (or cost) of substitute services would result in many fewer readings and a probable loss in productivity of the scientist of about 10 percent.

There is ample evidence of the inverse relationship of price and quantities demanded (i.e., price-elasticity of demand) for information products such as journals, books and technical reports [4,5,6]. There is also substantial evidence concerning the contribution that service and product attributes make to demand as well [7,8]. Trade-off analyses, by either conjoint measurement methods or disaggregated regression models, show that sales of documents such as technical reports, journal articles or journal issues depend not only on information content but also on speed of delivery and reproduction quality. The extent of use of library services such as online searching done by reference librarians depends to a large degree on quality of searches and response time. Thus, satisfaction with these user requirements clearly contribute to the use and value added to the information.

Economic aspects of the supply of information are not so clearly understood. However, one might assume that the free market of information services and products is such that market efficiency is achieved. That is, producer competition will force prices downward to find more buyers and consumer demand will push prices upward until their needs and requirements are met. Thus, supply and demand together will determine an equilibrium price. However, with information services and products this free market condition does not always exist. A substantial number of suppliers are not driven to supply their services by the revenue or profit motive. Other incentives are also important. For example, creators (such as authors) have a range of motives including financial return from royalties, recognition, payment of salaries for the work which resulted in creation of intellectual property and, with scholars, the desire to share their intellectual creations.

The term intellectual property suggests that created information is owned and, when it is patented or copyrighted, the owner has legal title.

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[*] Savings to scientists include savings of their time and/or equipment used in their research.

This concept seems simple enough, particularly when one considers only the content component of information. If someone steals information content, particularly if creative work is evidenced in a recorded form it is plagiarism, which is merely frowned upon in some circles and illegal in others. The difficult problem arises out of the need to process information to make it available over space and time, when needed. In order to do so, the form of the information often needs to be processed, altered or handled in ways that affect information form dramatically, and information content as well, but to a lesser degree. For example, the information form is normally transformed in order to enhance its attributes to make it more useful or valuable. The information may be transformed from one format to another to make it more precise (e.g., data sets converted to an equation) or understandable (e.g., text in one language translated into another). The structure of a format may be altered to make the information more accurate or meaningful, as in editing a text. The information content is often transformed from one medium to another to accommodate communication, reproduction, storage, etc. All these transformation processes can take place on information form without changing the information content, thus increasing its usefulness and value. In order to perform the information enhancing functions the ownership of the intellectual property (i.e., content) may be transferred from the creator to a publisher or other entity. There is a great deal of confusion about what is meant by the transfer of ownership and what the implications are of the changes made in information form as opposed to content.

Participants engaged in adding value to information form must be assured that the risks taken and investments made achieve a fair return. The problem is that new technology has meant that almost any interim participants in the information transfer stream, or the user, can capture the information inexpensively and perform subsequent functions without the approval (or even knowledge) of an "early" participant such as a publisher. This can have significant effect on quantitites demanded for and sales of the products or services of the "early" participant. Some evidence will be provided in a later section that such subsequent processing should optimize the flow and economics of information. However, the issue of ownership of intellectual property versus the economics and incentives of providing value-added services and products must be resolved in order for the improvements in flow and economics to be fully realized.

SECTION 2

INFORMATION FUNCTIONS AND PARTICIPANTS

One of the principal reasons for elaborating the extensive user information needs and the user information requirements is to emphasize that there are hundreds of millions of information needs and that each need is unique with respect to user requirements such as accuracy, precision, currency, speed of delivery, etc. In order to accommodate the wide spectrum of uses made of information, and requirements concerning information attributes, a variety of information processes and new technologies have evolved and many organizations employing millions of information workers are now engaged in performing information processing functions. Below we describe generic information processing functions that are performed in order to satisfy the multitude of user information needs and requirements and participant organizations whose principal activity is to perform these functions or to support the information processes.

2.1 Information Processing Functions

There are eleven generic functions that are involved in processing information content and form from its creation to its use. Information can originate from inanimate objects merely by their being there and by our being able to sense them by seeing, hearing, feeling, smelling, etc. Information can also originate from events such as an earthquake, sporting event or birth of a baby. Information content about objects or events can be created by someone for communication to others by describing the objects or events. Much of the intellectual creativity in such description (or reporting) is in how the information is expressed or composed. Creation of information content that is described or reported is an intellectual process unique to human beings. A higher order of intellectual creativity includes a scientist developing a new theory, a designer creating a new design, inventors coming up with ideas, people thinking about solutions to problems and so on. This kind of information is creation through one's intellect and wisdom. Information created at either level is sometimes referred to as intellectual property (if properly recorded) where property implies that it is something owned by the creator or someone else. When patented or copyrighted, it implies having legal title.

Another information transfer function is assimilation and use of information. We have discussed types of information use earlier in this section. Obviously, these user information needs are satisfied by the content component of information. However, user information requirements are largely satisfied by the information form and the degree to which attributes such as accuracy, precision, currency, speed of delivery, accessibility, etc., are achieved.

The essential components of communication between people or things are sending, transmitting and receiving signals which convey information content. Communication between two people involves information creation and composition, sending, transmitting and receiving, and assimilation. These functions are depicted in Figure 2. An example of such communication would be personal conversation where creation might be an idea generated by someone who sends the information message by talking; it is transmitted by sound waves, received through hearing and then assimilated by a second person.

Unfortunately, such personal point-to-point communication is extremely limiting in terms of amount of information that can be communicated, the timeliness possible and distances that can be covered. Some created information has a large number of potential users, who have special information requirements. Thus, over the years several additional information functions have evolved for processing information to conform to user information requirements. These functions are added (in Figure 3) to the creation, communication, and assimilation and use functions given in Figure 2.

All generic information processing functions involve information content and form. Four of the functions deal with content in various media. These functions include recording and reproduction, physical transformation, storage and preservation, and physical access which are done largely to accommodate information attributes such as currency, speed of delivery, availability and accessibility. Four other functions which

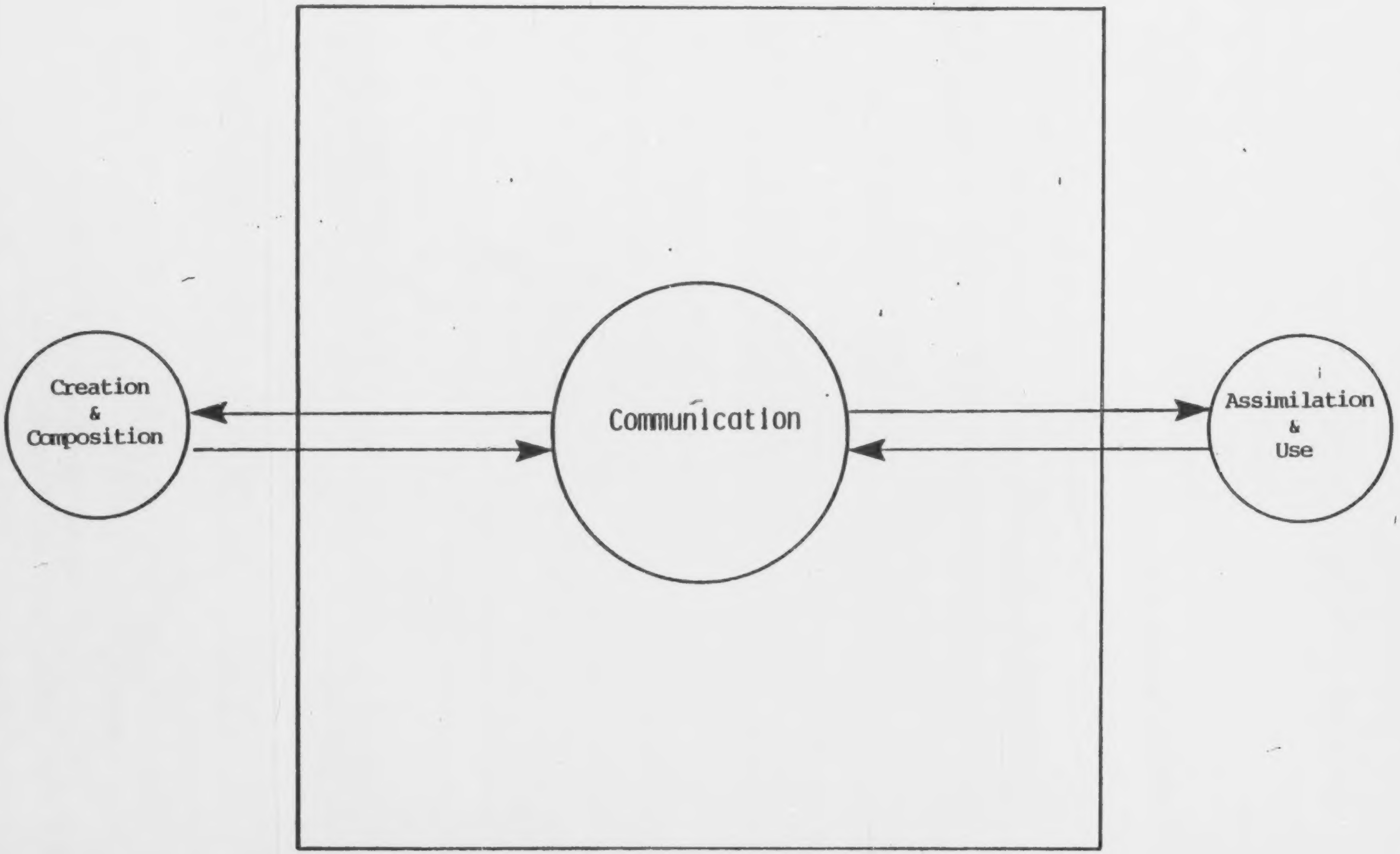

Creation
&
Composition
Communication
Assimilation
&
Use

Figure 2: Information Processing Functions

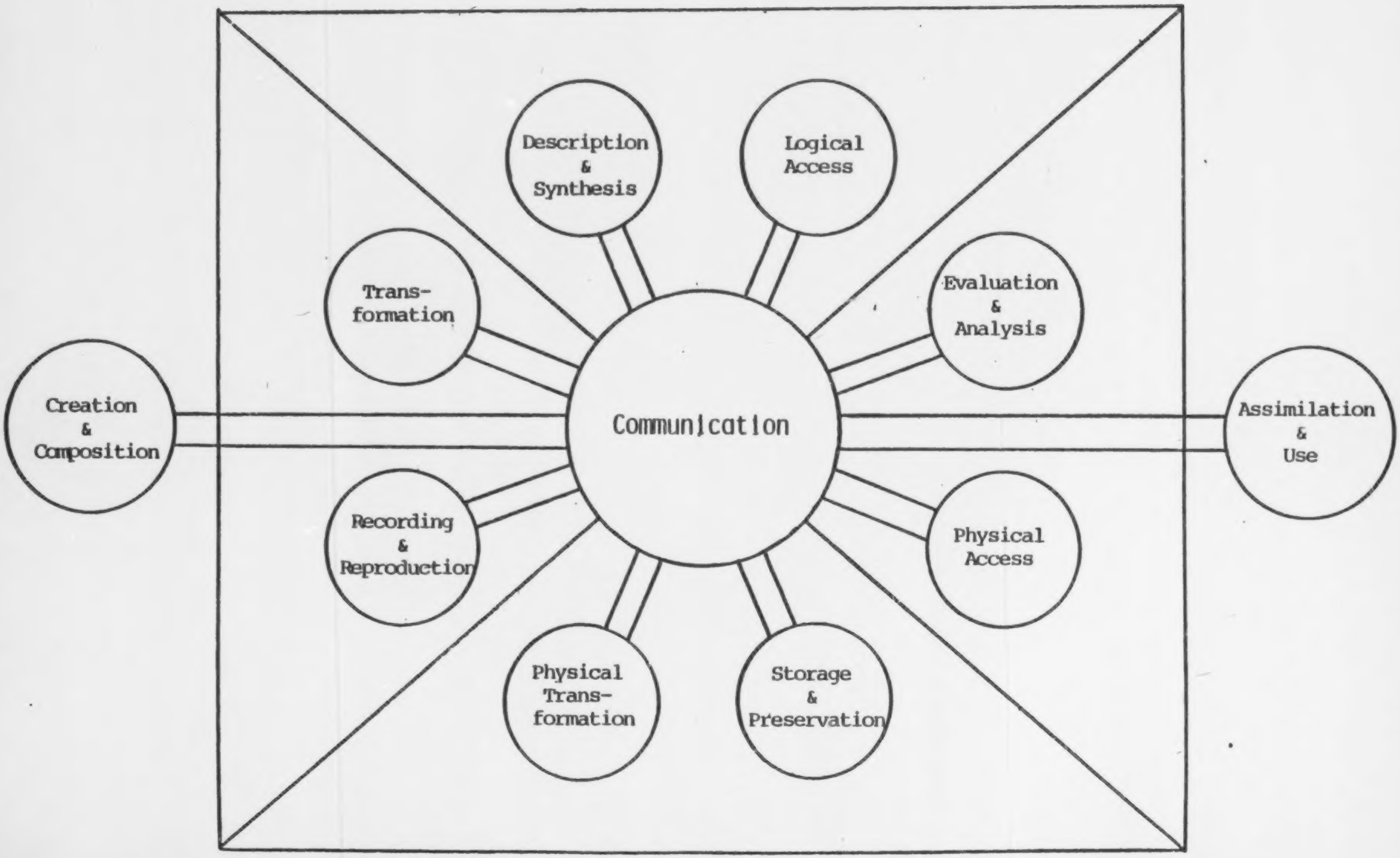

Description & Synthesis
Logical Access
Trans-formation
Evaluation & Analysis
Creation & Composition
Communication
Assimilation & Use
Recording & Reproduction
Physical Access
Physical Trans-formation
Storage & Preservation

Figure 3

involve content and format and structure are transformation (of format and structure), description and synthesis, logical access, and evaluation and analysis. These latter functions all involve intellectual processing of information content which improves accuracy, precision, and knowledge about information content. The eleven generic functions are depicted in Figure 3. The functions involving media are in the bottom half and those dealing with format and structure in the top half. Those on the left side tend to be input (or creation) oriented and those on the right side stress output (or use). All the arrows on the figure show that the information content must be communicated for any of the functions to be performed.

One of the first functions performed in information processing is recording and reproduction. Recording information could be as informal as writing one's thoughts down on paper or it could be highly formal recording such as in publishing, where the recorded master image could be a printing plate. With electronic media, an initial recording (or master image) might be made and stored for later, further use or it may be reproduced for multiple use. Thus, recording and reproduction are essential information processing functions. Copies of newspapers, musical records and video tapes are common examples of recorded and reproduced information media (or of forms of reproduction). A copy of a book might be communicated to a user through the mail (as the transmission medium) or it could be communicated to a library where it is stored for future use.

Throughout information processing the information content is often transformed from one medium to another. For example, information content may be first recorded on paper, transformed to electronic (storage) medium by word processors, back to paper by printers, to electronic medium by OCR, to a master image by photocomposition and plate-making, to paper by printers and so on. Thus, physical transformation is a generic function that can take place many times between information creation and use.

Recording is done partially to preserve information so that it can be communicated later. If frequent use is anticipated, the information will be reproduced and the multiple copies transmitted (or the information might be "broadcast") to a mass audience. In the case of newspapers and magazines, many copies are transmitted by delivery or mail to one's home or office, or they are sold by newsstands since the information being transmitted does not have a long life and storage is not necessary. Information found in books and scholarly journals, on the other hand, has a much longer life. Thus, some means is necessary to store the medium. Similarly, the frequency of use of numeric information varies greatly, as does its currency requirement. Some numeric information such as weather reports has little use after a day or two (although years of weather information is archived in huge warehouses). Other numeric information, such as census data, may be used years after it is created. Numeric information is stored in many media including paper, microform, and electronic depending on such factors as frequency of use, speed of access, required media and cost.

If information is stored, it must be accessed before it can be used. Information stored in computers can be accessed and communicated by electronic means. One of the most important activities of librarians is to access information media, whether on the shelves of their library or through acquisition from other sources. This form of access is called physical access because the information content is presented in the form of some physical medium.

The objectives of storage and physical access are to accommodate information that is infrequently used or used over a long period of time. Libraries, for example, attempt to acquire books, journals and other media that specific individuals infrequently use but are collectively frequently used. For example, generally it is best for scientists to subscribe to a journal if they read the journal more than five or six times a year. If fewer readings occur, it is less costly to use a library, provided it is conveniently located. Speed of access from storage can be important. Speed of access can be enhanced by organization and control of the storage medium, and distance to storage also can play a role. For these reasons, a variety of storage media (i.e., paper, microform, electronic, etc.) and communication media have evolved to optimize the trade-off between frequency of use, speed of access, correct medium, location and cost.

Generic functions performed by or for the creators of information include transformation of information format or structure. Transformation is performed to help improve information accuracy so that users can better understand or get more meaning from the information. A good example of this function is the editing of written material so that sentence structure is changed and words substituted to enhance the expression of the message being conveyed. Another reason this function is performed is to vary the dosage of information which is provided; that is to make the information more precise. For example, numeric data can be aggregated,modelled or summarized to provide an encapsulated dose of information. Precision of information also has implications for cost since receiving too much information can cost a great deal in terms of the time and effort required to filter out the needed information. On the other hand, some excess information, if easily screened can yield inexpensive transmission. For example, newspapers, magazines and scholarly journals package and transmit much more information than is likely to be read by any one person. The transformation function is also done to satisfy the information requirement that information be provided in an understandable form. The most obvious example of transformation mentioned above is the translation or interpretation of foreign languages.

Secondary information is distinguished from primary information that has been newly created and primary (or latent) information which has been recorded and stored for future use. Secondary information is a description or synthesis of primary recorded information. The description and synthesis function is performed on primary information content for two basic purposes. One is to organize and control stored information and the other is to help find needed primary information.

If information is stored in paper, microform, electronic form, etc., it must be organized and controlled in order to be accessed for use. Whether storing recipes in the kitchen, family photographs, books in a library, or data in computers, groups of information packages must be organized or they can not be found when needed. The Library of Congress has 526 miles of shelves of books. Imagine how difficult it would be to find a particular book if books were randomly stored there.

If information is not used immediately and when an information need arises, it is often necessary to identify whether such information exists, locate where it is stored, determined if it is available and analyze its appropriateness. This frequently happens with information used by professionals such as scientists, lawyers and so on. A scientist may want to know whether a certain experiment has already been performed or a lawyer might want to know if a precedence for a criminal case has been set. In order to provide such logical access, information systems have been developed which use descriptions and syntheses of information content in such forms as indexes, catalog codes, or even abstracts. An important aspect of logical access is the need for searchers to be familiar with the content component of information.

Bibliographic catalog entries, indexes and abstracts are created from information found in primary sources such as books or journal articles. As such, the description and synthesis generic function may be thought of as creation and composition of secondary information. This information is in turn recorded and reproduced, physically transformed, stored and physical access provided from printed paper publications and electronic data bases. The storage of secondary publications on electronic databases require a high degree of organization and control in order to speed response and minimize costs. The publications and databases also need to be physically accessed. Physical access is facilitated through a number of database directories (and the extensive knowledge of librarians). Physical access can be achieved through stored catalog cards or bibliographic publications in either paper, microform, or electronic media. There are also special bibliographic materials which attempt to select certain items (e.g., a list of journal articles dealing with a scientific specialty, product category, transportation modes, etc.) which are of interest to select groups of users. Just as primary information format and structure is transformed, so must secondary information format and structure be transformed, in order to be communicated and presented in useful forms. Logical access to secondary information is provided in directories of data bases or directories of directories. The logical access of primary information function is equivalent to the use functions of primary information.

Information services which provide access (either physical or logical) to information usually do so on behalf of end-users. Another function performed on behalf of end-users is evaluation and analysis (which deals largely with information content). For both physical and logical access, evaluation involves an assessment of the accuracy and precision of information contents. Many end-users need to know how good the primary or secondary information contents are that are being provided. End-users often also require a preliminary analysis and summary of the information contents that are accessed for them. Access and evaluation and analysis functions are done by intermediaries because of their knowledge of the information content of data bases and because they can perform these functions faster, better and/or less expensively than the end-user can. An extension of analysis might involve description and synthesis which relates information content found in different sources such as in writing commentaries or state-of-the-art reviews.

Not only are the generic functions performed on secondary information similar to those performed on primary information, but also the attributes are similar. For example, accuracy and precision of searching are extremely important (commonly measured by recall and precision). Speed of delivery is a very important attribute of search services as are accessibility and availability of secondary databases. Furthermore, the economic attributes of frequency of use, cost and value hold here as well.

2.2 Participants in the Information Environment

In recent years, a large number of different kinds of oganizations and services have evolved to satisfy all the various information needs and requirements. Some accommodate the varied frequency of use; others the currency of information, speed of delivery, or location. Some help make the information more accurate or more precise. While others enhance value of information or help reduce costs. These organizations evolved as a result of balancing hundreds of trade-offs among these desired information needs and requirements in the overall information environment. These participants are not unlike components of an ecological system which is constantly changing and adjusting to the environment. Just as the emergence of man in the wilderness, or the use of pesticides on farms, have had a chain effect, so does introduction of new technology, external economic changes, changes in user behavioral patterns, and growth trends in the number of creators and users of information affect the entire information transfer system. It is a very dynamic system with a high degree of economic and systemic interrelationship.

The information participants can generally be grouped by the functions they perform in information processing from creation to use. These groupings are displayed in Figure 4 on the next page. Examples of creators and composers of information content include reporters, survey researchers and laboratory technicians at one level and authors, architects, cartographers, and comosers at another level. Referring to the eleven generic functions of information processing on Figure 3, note that individuals do sometimes perform all of the functions. For example, a scientist may create and compose an article manuscript, record and reproduce it, physically transform it by word processing, store it in the office, get physical access to it, communicate it to a publisher, re-edit it following refereeing, prepare an abstract, re-analyze it, and so on. However, because of economics most information prepared for distribution is also processed by several participants that specialize in performing certain functions.

Publishers perform (or accept responsibility for) some transformation of format and structure through editing and preparation of graphics, recording of master images (e.g., typesetting, photocomposition, and sometimes engraving) and reproduction for communication (i.e., circulation) and storage. They also advertise and market publications (although, both jobbers and subscription agents also play a major role). Recording companies, film producers and secondary database producers, etc. perform similar functions.

Libraries have a unique role in the information environment because of some of the attributes and requirements of information expressed earlier. Some information has a limited audience, some information is not needed right away and, therefore, must be stored to wait for its need to arise, and not everyone can afford all information. We mentioned above that publishers, filmmakers and others record and reproduce and communicate

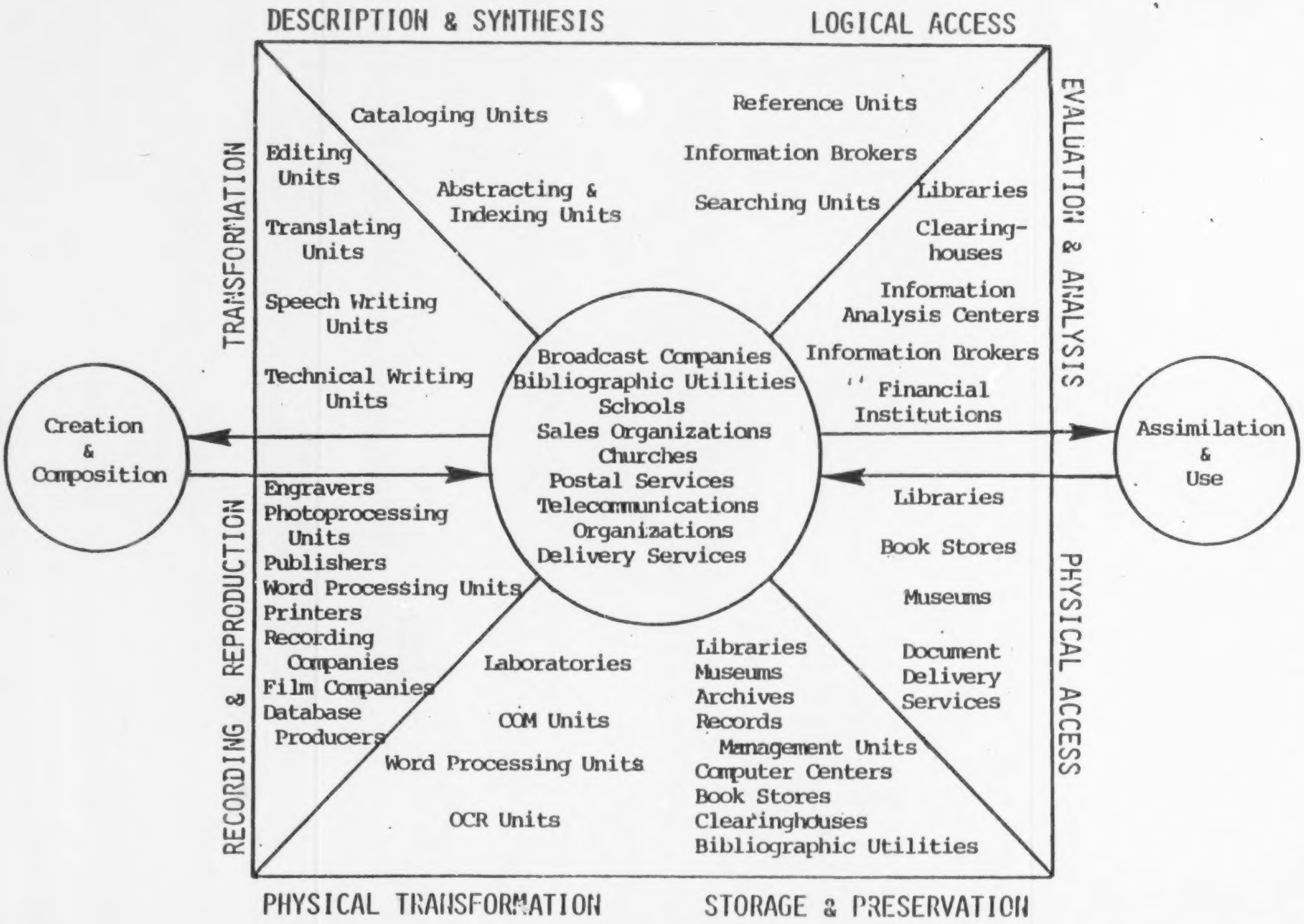

DESCRIPTION & SYNTHESIS
LOGICAL ACCESS
EVALUATION & ANALYSIS
PHYSICAL ACCESS
STORAGE & PRESERVATION
PHYSICAL TRANSFORMATION
RECORDING & REPRODUCTION
TRANSFORMATION
Creation & Composition
Assimilation & Use
Cataloging Units
Abstracting & Indexing Units
Editing Units
Translating Units
Speech Writing Units
Technical Writing Units
Reference Units
Information Brokers
Searching Units
Libraries
Clearing-houses
Information Analysis Centers
Information Brokers
Financial Institutions
Broadcast Companies
Bibliographic Utilities
Schools
Sales Organizations
Churches
Postal Services
Telecommunications Organizations
Delivery Services
Engravers
Photoprocessing Units
Publishers
Word Processing Units
Printers
Recording Companies
Film Companies
Database Producers
Laboratories
COM Units
Word Processing Units
OCR Units
Libraries
Museums
Archives
Records Management Units
Computer Centers
Book Stores
Clearinghouses
Bibliographic Utilities
Libraries
Book Stores
Museums
Document Delivery Services

Figure 4

information found in print materials (e.g., books, newspapers, magazines, journals, etc.), photographic materials (e.g., movies) and electronic materials (e.g., video cassettes, audio tapes, records, etc.). Libraries provide access to this recorded information through materials they acquire and store or get on request from their patrons when needed. Libraries also help people access, evaluate and analyze needed information through catalog systems for information materials found in the library, bibliographic reference materials and services, and referral to sources of information including other libraries (that sometimes have special collections), information clearinghouses, or individuals that have special knowledge or other competencies. Libraries also provide facilities to satisfy information needs through information equipment such as microcomputers, computer terminals, or audio visual equipment.

Different kinds of libraries have evolved to satisfy certain information needs. For example, public libraries largely serve personal needs and to a lesser degree life-long learning information needs; school and academic libraries provide information for life-long learning; and there are libraries in most workplaces that have a sufficient number of professionals and other workers. The basic functions and services provided in these different environments are essentially the same, except the kinds of information handled varies, as does the relative importance of the functions and services.

There are tens of thousands of libraries, archives and information centers found in the U.S. They all perform a unique and extremely important role in the information environment. Over 9,000 public libraries in the U.S. are used primarily to satisfy the personal information needs and needs for life-long learning. For solving day-to-day problems they serve as information and referral centers, they maintain reference files and directories of community resources available for assistance in dealing with basic information needs. Many public libraries have become much more than sources of news and recreational information; they are community information centers. They serve as a source of pamphlets, booklets and other information publications that cover all aspects of personal needs mentioned earlier. Of course, not all libraries carry hundreds of thousands of such materials, but they do provide reference materials and they do have the ability to access them from elsewhere when needed. The point is that public libraries (as well as libraries in the workplace) serve not as a warehouse of information, but rather as a point of access to information. Frequently used information is found on the shelves of these libraries because it is more economic and timely to do this. Less frequently used information is acquired by request from other sources when the need for the information arises.

Public libraries also provide extensive information resources for life-long learning. In some communities they serve as school libraries. In others, they serve as a back up to the school libraries and they provide educational and training information for pre-school children, working and other adults, and individuals in their retirement. Some public libraries provide facilities and new technology for training and for educational purposes. Classes are held in the evening, computers are used for computer-aided instruction, audio visual materials are used for seminars, and many public libraries have special equipment and special information materials for the blind and deaf in meeting their information needs (learning or otherwise).

Storage is also accomplished by a number of other participant institutions such as archives, book stores, clearinghouses, museums, computer centers, and records management units for primary information and many of these participants and bibliographic utilities for secondary information. Most of these storage participants require some form of organization and control, although not all of them require description and synthesis of information content to do this. Storage implies physical access and so most of the above participants must provide physical access to information content in various media. However, there are some services that provide physical access from another organization's store. Upon client request, some document delivery services (e.g., Informaton on Demand) identify and gain physical access to documents such as journal articles and technical reports from libraries. In the future, it seems likely that there will be a trend toward getting such materials from document delivery services that have their own collection (e.g., UMI Article Clearinghouse, Institute for Scientific Information and USBE).

In the past fifteen years, a number of information analysis centers have come into being. These centers provide services for logical access, in-depth evaluation and analysis of both primary and secondary information and physical access to materials in highly specialized areas such as material properties, nuclear safety, radiation shielding, etc. Also, library reference units, information brokers and information search units found in organizations and as independent extrepreneurs have become important participants. They have evolved because of new online technology and because end-users find it less expensive to use them. Furthermore, these intermediary participants can often provide better logical access, some degree of evaluation and analysis and physical access than can the end-user.

SECTION 3

INFORMATION TECHNOLOGIES

In this section the applications of available and emerging technologies are linked to the handling of information according to the role of the technologies in supporting the various functions performed on information and information packages, and the various user needs and requirements. Many of the technologies that are becoming available are used to support multiple functions but the effect on the delivery of information and information services often varies, thereby altering the value that is added to the information by various information service organizations.

Following the conceptual/analytical framework outlined in the previous section, the technologies will be discussed according to their primary application to functions concerned with information content, or with information form (format, structure, medium).

3.1 Creation and Composition

Perhaps, more than any other technologies, the technologies that are used to support the creation and composition of information have had the greatest impact on information services. For the first time with these technologies the potential to develop fully integrated information systems based on a single message format (i.e., electronic signals) is realizable. The technology that has had the greatest influence on the creation and composition of information is word processing. The ability to input text, display text, edit and modify text at the push of a button enhances the creative process by relieving the creators (authors) of trying to piece together ideas through the restrictions imposed by paper and pencil media. The move from a paper-based world to one increasingly based on electronic media for handling information give rise to a number of intellectual property concerns not because of the nature of electronic media or electronic signals, etc. but because of the scale of electronic operations and the ease with which electronic signals can be manipulated "en masse".

Word processing technlogies, sometimes referred to as text editors, have evolved from the rather crude systems of the 1960's to the very sophisticated systems available today. The early systems worked on a single line of text at a time and to change a word or character in that line the entire line generally had to be re-input. The displays used in the early systems often only handled 24 characters at a time. Trying to format an entire page of a document by using a 24 character-wide window was virtually impossible. The systems available today provide access to single characters, support global replacements, display entire pages of text (although half pages are more usual), provide graphics capabilities, support multiple users, etc. More recently, systems are being developed that check for errors — primarily typographical errors — by matching words input against an electronic dictionary. Systems are also being developed which analyze "writing" style and provide hints on how to improve a document stylistically. These analyses are based on analyses of texts considered to be of "superior quality" and measuring various attributes to the text being created against the scores for those attributes of the "superior quality" documents. The attributes include paragraph structure, sentence length, word repetitions, etc. Thus, instead of being passive receptacles of documents, word processors are themselves becoming active participants in the process of creating a document, particularly from the perspective of structure.

A second technology that has also had significant impact on the provision of information services, the general public's awareness of information and information services and the creation of information is the microcomputer. In fact, the basic technology that has driven the development and mass production of microcomputers is the miniprocessor which enabled very large scale integration of components of electronic circuits into miniaturized components or "chips". These miniaturized circuits can be mass produced thereby reducing the cost per chip. Most information handling technologies available and in development today are based on some form of microprocessor technology.

In 1971, the first microprocessor was announced by Intel Corporation. In about 1976 the first microcomputers were available commercially. As word processors, microcomputers have developed in terms of capability and sophistication. They offer a variety of hardware configurations (single user, multi-user), peripherals (disks, printers, etc.) networking and communications options and software. Word processing software has been available for microcomputers since their original development and, for a while, constituted the most popular application of microcomputers after computer games. However the use of word processing software on microcomputers recently fell to third place after games and spreadsheet packages. Nevertheless, the availability of word processing software packages for use with microcomputers has resulted in their use for creating first (and subsequent) drafts of documents, whether or not those documents are intended for publication and distribution. Micro-based word processing packages offer the full range of features described above.

The widespread adoption of word processing systems whether in the form of special purpose systems or as single applications of general purpose systems creates some new problems. In a sense, the problems are not new, but they become more significant problems as a result of the ease with which entire documents can be transferred from one system to another and changes can be made globally to those documents. The major intellectual property question that arises is, "when does a modified document become another document and who is the author?".

Other technologies that also support creation and origination of information are synthesizers, used for example, in composition of musical scores, animation/simulation systems for creating cartoons and animated films, and CAD/CAM systems wich support the creative design process by providing rapid feedback to the designer about the efficiency and effectiveness of the design. As before, the same problems arise over intellectual property. With the ease of transfer and modification of the electronic scores, designs, animations, etc. who is the author of modified versions and how can the original author (or creator) protect his stake in ownership.

The technologies identified above are examples of recent technological developments that support the creative process. They are primarily concerned with supporting the accuracy, precision, currency and availability of the information content, although, to some extent, they do also affect the form of the information and its accessibility.

3.2 Recording and Reproduction

A number of technologies have recently been developed to support the recording of information, i.e., the creation of the first master image. All of the technologies discussed in the previous subsection are to some extent involved in recording of information. Other technologies include computers (of all sizes), printers of varying types, tape recorders, video recorders, cameras, photocomposition equipment, etc.

Each of these technologies has developed over a considerable period of time and most of them are now using microelectronic components. The technology that has to date caused the greatest controversy with regard to intellectual property is that of videorecording. With the availability of videotape recorders, individuals are able to copy broadcast information. Since the mid 1970's the video industry has grown exponentially particularly since the Supreme Court decision on the Sony (Betamax) vs Universal allowing copying of broadcast information, movies, news, documentaries, etc. Even more concern has been expressed by producers of pre-recorded videotapes over the potential to produce "pirate copies" of commercially distributed pre-recorded videotapes and resell them. With two recorders, one can make copies (just as with two audio tape recorders).

Technology supporting the recording function is primarily concerned with the form of information. It does so by improving the accuracy of information (with better quality recorders providing greater accuracy usually at a higher cost), and also by improving, to some extent, the accessibility and currency of information.

The technologies used for reproduction of the master image are well developed and have not changed significantly over the last few years since they incorporated electronic components. Two main technologies are photocopiers and printing presses. Since their redesign based on electronic components they have (like all technologies that incorporate microelectronics) become smaller, more powerful (in terms of capability and sophistication), and less expensive. The quality of reproduction has also improved over time to the extent that reproduced copies are often better in quality than "originals" through the introduction of "error correction techniques."

The technologies used for reproduction have for many years been the concern of publishers, particularly over photocopying. The main effect on newer equipment on this problem is the fairly recent introduction of home photocopiers. Thus the problem remains the same but the scope of the problem is increasing.

The technologies that support the function of reproduction are exclusively concerned with the form of information, particularly its accuracy (in terms of quality of reproduction), accessibility (again in terms of quality) and timeliness with which information can be distributed.

3.3 Physical Transformation

The physical transformation function involves the changing of the medium of information. The technologies that support this function operate in a variety of ways.

The most common form of transformation technology is the modem (modulator/demodulator) which converts information in digital form and back to analog form for the purposes of communication. Modems enable terminals of all types to communicate with computers of all types and computers to communicate with other computers. Over the years they have improved their performance in terms of accuracy and speed of transmission.

Another technology used for transformation of information is optical character recognition (OCR). This technology embodied in a variety of OCR devices from light pens to flat-bed recognition devices, transforms characters into digital, electronic form for a variety of purposes. For example, a flat-bed OCR device can be used to scan a page of text, convert it into digital form and transmit it to a computer storage device which is part of a full text retrieval system. These OCR systems are now capable of encoding handwriting as well as printed or typescript documents. The latest systems are able to decipher multiple type styles and also have the ability to "learn" new scripts and type styles.

Similar in concept to OCR is digital scanning which converts information in any recorded visual form to digital electronic form. These scanners can encode text, photographs, charts and diagrams, drawings, music scores, etc. into electronic form for storage or communication purposes. Scanners have improved over the years in terms of their resolution (both input and output). Today's devices can scan over 400 lines per inch to reproduce the quality of an original. Some scanners are able to transform information in microform (as well as paper form) to electronic form and from electronic form to paper form. When combined with a communications linkage these scanners form facsimile systems. A special form of scanner is the Kurtzweil Reading Machine which converts information in textual form on paper into simulated speech. These systems provide access to the world of printed materials to the visually handicapped.

Yet another technology used for transformation purposes are microform reader/printers which, like some of the scanners mentioned above can convert microform information into paper form. However, in these cases, a intermediate digital electronic form is produced.

3.4 Storage

Storage technologies have developed more rapidly than any other technology over the last two decades. Each successive development has meant that more information can be stored in decreasing physical spaces. For many years, microform was the solution to many information storage problems. However, recently the various disk storage technologies have emerged as the probable information storage media of the future because of their vast storage capacities, small physical size and ease of transportation.

Two disk technologies have evolved beyond the traditional magnetic disk storage used by computers. They are the optical video disk and the optical digital disk. The optical video disk stores information in video format and is capable of storing 54,000 frames of information. The optical digital disk stores information in digital form and is currently capable of storing 2 x 10^{12} bytes (or characters) of information. The capacity of the optical digital disk doubles with each new generation. Several different recording and production techniques are used with the optical digital disk but the laser-encoded and laser-read disk is likely to become the prevailing form.

A recently developed relative of the optical digital disk is the laser compact disk often called CD ROM (Read-Only Memory). This disk is likely to become increasingly popular for information storage because of its size (5 1/4 inch instead of 12 inch which means that smaller data sets can be cost-effectively stored), and the low cost of disk players (from $200 upwards rather than the $3,000 optical digital disk player). Furthermore, because of the adoption of the compact disk for sound recordings by the music industry, there is a standard format for recording. Thus, recordings produced by various producers and using disks manufactured by different manufacturers can all be played back on a variety of disk players. The potential for distribution of information on compact disk has not yet been realized although information providers are just investigating their potential. Small libraries and groups of libraries are considering storing their catalogs on compact disks. They can then be accessed using microcomputers with interfaces to disk players (and some search software). There is considerable potential too, in library users acquiring copies of the catalogs for use in the home or office so that the availability of needed information can be checked to some extent before visiting the library.

All of these different storage technologies affect the accessibility of information, the timeliness with which information can be delivered, and its currency on delivery.

3.5 Physical Access

Technologies to support access to information have increased in number and variety of the last 50 years or so, mainly as a result of new ways of recording and storing information. Depending on the way information is recorded and stored, different technologies are used for accessing information. Examples of access technologies in common use are telephones, television sets, tape players, disk players, microcomputers, terminals and printers. Each of these technologies provides access to information in different ways and presents information in different ways.

A major issue relating to access that arises is that information captured (i.e., recorded and stored in microform or electronic form, or magnetic form) are not directly accessible by users, as is the case with paperform. Consequently, organizations that provide access to information have to make the information access technologies available to the users together with the information in the captured form. If such technologies are not provided to user's, an information "elite" is likely to develop comprising those who can afford to acquire the range of information technology devices needed to access information captured in a variety of ways. When some of these technologies were used for recreational and entertainment purposes only it was the choice of each individual as to whether or not to take advantage of the recreational and entertainment offerings (TV, radio, etc.). However, if these devices become the sole mechanism for accessing information or certain types of information, then the right of the individual to information may be threatened if access points are not made available.

In addition to the obvious effects on accessibility, these technologies can affect the timelines of information delivery.

3.6 Transformation

Another form of transformation is concerned with structure of information. The technologies that are being used to support this type of transformation include automatic translation and computer-aided translation. Both technologies, based on developments in artificial intelligence, support the transformation from one language into another, or from one comprehension level of a language to another comprehension level of the same language. Examples of these technologies include systems which translate to and from English, French, German and and Spanish, and systems which translate "legalese" into recognizable "lay" English. Automatic translation systems perform the entire translation and present a final version, and computer-aided translation systems interact with a user to produce finalized translations. Such systems work well to some degree but leave considerable room for improvement in the accuracy and precision of translations.

One final technology that is being increasingly used to support transformation is computer graphics. Graphics systems are used to transform numeric information into graphic form to facilitate understanding and assimilation. Some individuals assimilate visual and graphic information much more readily than tabular or numeric information. There is a great deal of untapped potential in computer graphics for transforming information into forms understandable to various user constituencies.

Transformation, by definition, is concerned with the form of information. The transformation technologies affect the accuracy and precision of information, and its accessibility to various user groups.

3.7 Description and Synthesis

This function is essentially concerned with the generation of descriptions and surrogates for information packages usually in the form of synopses, abstracts, index terms, catalog information, etc. These surrogates are prepared to facilitate the retrieval of information content appropriate to the user needs and requirements.

A number of technologies support this process of description and synthesis. One that has had a major impact on the development of cataloging information is the evolution of automated, shared cataloging systems which store machine-readable databases of cataloging information which can be shared by subscribers. Examples of these systems include OCLC, RLIN, WLN and UTLAS in North America. An interesting question has arisen as to ownership of the databases (the OCLC database-particular). The nucleus of these databases is the Library of Congress MARC (Machine Readable Catalog) database. The remainder of the input is provided by the subscribing libraries. Individual libraries using the database an append their own locally relevant information to records in the database, or if relevant records do not exist, they can input full records. Thus all the input is provided either by Library of Congress or individual libraries. OCLC makes the database accessible through their automated system and network. Recently OCLC applied for copyright of the database in a controversial move. In response, two of OCLC's regional subnetworks, AMIGOS and SOLINET, have applied for co-ownership of the database on behalf of their members. Meanwhile, the Cleveland Public Library one of the largest of OCLC subscribers is extracting the records it input and copied relevant to its own collection and is, together with an automated system vendor, setting up a competing shared cataloging service. All of these events have brought to prominence the major question of ownership: Is the creator of information the owner, or is the "value adder" the "owner"?

Other, less controversial, technologies that support the surrogation process are based on advances in artifical intelligence, in the area of natural language processing and understanding. Systems exist today to support automatic synopsis preparation and automatic indexing. Over the last few years these systems have improved in terms of the accuracy and precision with which the surrogates represent the information being reduced. In a sense, one might extend the ownership debate mentioned above to include the question of ownership when a machine creates information. One may also question whether or not an intellectual process has occurred.

The technologies that support description and synthesis are concerned with the content of information and its accurate and precise representation. They also help to make information more accessible through the use of surrogates.

3.8 Logical Access

Logical access involves the identification, location and availability of information and information packages. Logical access to information falls into two main categories: access to information packages, and access tothe information content itself. Different technologies support each of these two types. The technologies that support access to information packages are catalogs and circulation systems. These systems enable a users to locate where each package is. Such systems have become relatively sophisticated and support full Boolean as well as keyword searching.

Technologies that support logical access to information content include online retrieval systems, database management systems and management information systems. These systems have evolved over the last decade to provide very sophisticated, user-friendly access to information stored in computers.

All of the technologies that support logical access to information and information packages are primarily affecting the accessibility of information and information packages.

3.9 Evaluation and Analysis

This function is concerned primarily with information content. The evaluation and analysis may be achieved through the use of surrogates although ultimately the orginal content is the subject of evaluation and analysis.

Various technologies have been developed to support the evaluation and analysis function. Various types of instrumentation and computers help to analyze information. Management information systems and decision support systems also help to evaluate and analyze information. Recent developments include the emergence of knowledge bases to support these functions. Today, knowledge bases are databases containing "commentaries" on the state of a particular field of study or topic of interest. These knowledge bases can be thought of as "explicit" knowledge bases because the commentaries (or synopses, etc.) have to be created and input into the base for subsequent retrieval by users. However, the knowledge bases of the future will be "implicit" knowledge bases which will be created automatically by computers that understand natural language and can make connections between related concepts. This is the goal of the fifth generation computer.

Both types of knowledge base do enable users to make judgements about the information they are interested in. This whole area of information evaluation is becoming a major issue as a result of the accelerating accumulation of recorded information, concern about information overload and information quality. The technologies that are emerging to support this function will continue to evolve and affect the accessibility of information and the timeliness of information used.

3.10 Assimilation and Use

Few technologies actually support the assimilation and use of information and this area represents a potential development area for the information field. Nevertheless, a few technologies do exist to assist the information user. Examples include decision support systems which help to present information in a form in which it can be directly used; CAD/CAM (computer-aided design, computer-aided manufacturing) systems which enable users to use information and display the effects of that use on designs and manufacturing processes; and graphics which can facilitate assimilation.

Each of these technologies affects the accessibility of information and the timeliness with which it can be used.

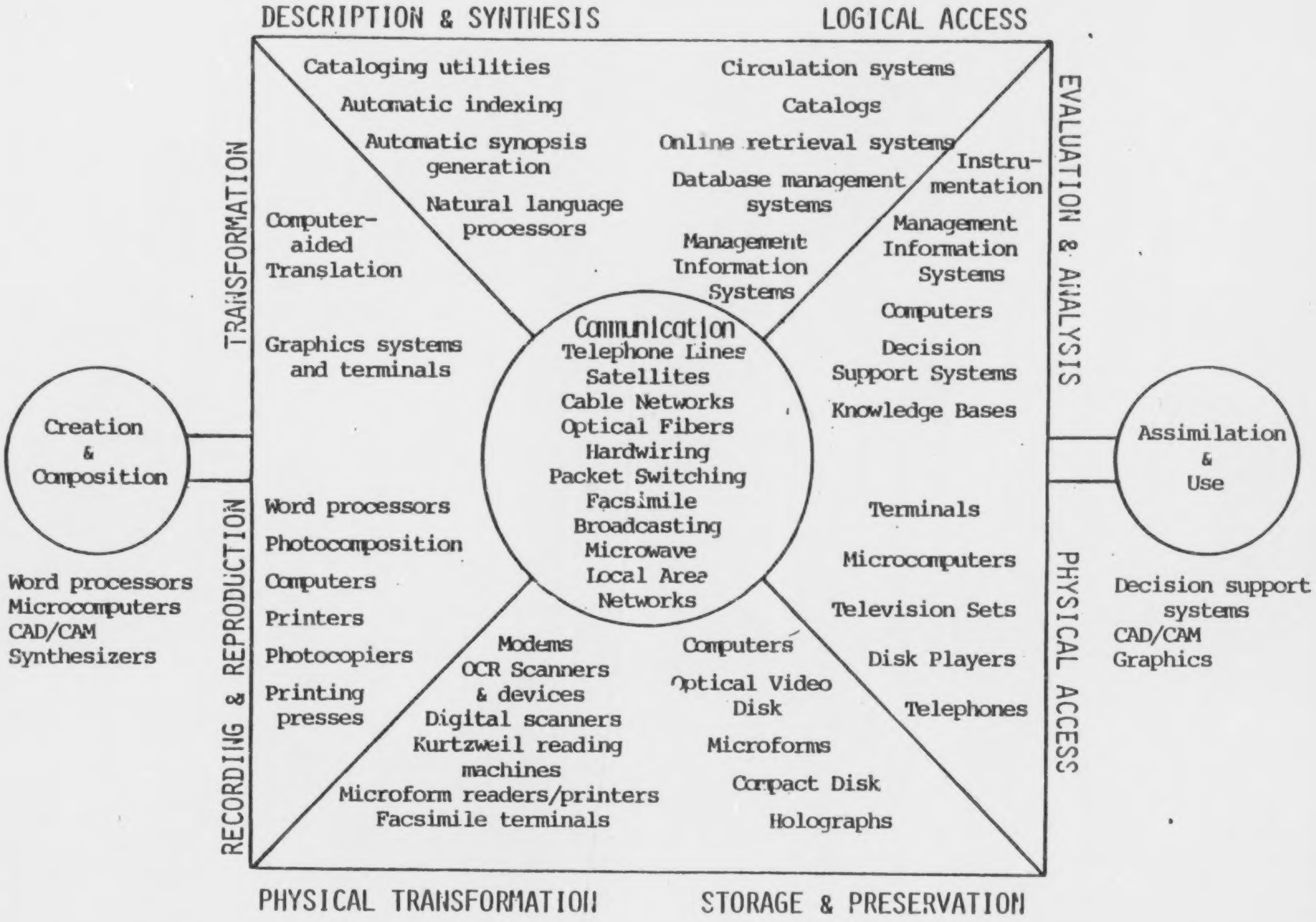
3.11 Communication

Most of the technologies mentioned above can only be used through some form of communications technology. Communication technologies have developed very rapidly since the introduction of the telephone. Many options for communications exist today and selection of a particular technology over another is usually determined by volume of information to be communicated, speed of communication, cost of communication, form of communication (whether point-to-point, or point-to-group, or point-to-mass, etc.), terrain over which information is to be communicated, distance over which information is to be communicted, etc.

Examples, of prevailing and emerging communications technologies are telephone lines, electronic mail, data communications, cable networks, optical fiber cables, hardwire linkages, local area networks, broadcasting, (TV and radio), microwave, satellites, and facsimile transmission. Each technology has advantages and disadvantages, and each has a specific place in the provision of information and information services. However the argument and concerns relating to access technologies and the creation of an "information elite" also apply to communications technologies, particularly as not all communication technologies are universally available.

These technologies affect the accuracy of information communicated, the currency of information, the timeliness of delivery and accessibility of information.

The various technologies used to support information transfer functions are summarized in Figure 5.


DESCRIPTION & SYNTHESIS
LOGICAL ACCESS
EVALUATION & ANALYSIS
PHYSICAL ACCESS
STORAGE & PRESERVATION
PHYSICAL TRANSFORMATION
RECORDING & REPRODUCTION
TRANSFORMATION
Cataloging utilities
Automatic indexing
Automatic synopsis generation
Natural language processors
Circulation systems
Catalogs
Online retrieval systems
Database management systems
Management Information Systems
Instrumentation
Management Information Systems
Computers
Decision Support Systems
Knowledge Bases
Terminals
Microcomputers
Television Sets
Disk Players
Telephones
Computers
Optical Video Disk
Microforms
Compact Disk
Holographs
Modems
OCR Scanners & devices
Digital scanners
Kurtzweil reading machines
Microform readers/printers
Facsimile terminals
Word processors
Photocomposition
Computers
Printers
Photocopiers
Printing presses
Computer-aided Translation
Graphics systems and terminals
Communication
Telephone Lines
Satellites
Cable Networks
Optical Fibers
Hardwiring
Packet Switching
Facsimile
Broadcasting
Microwave
Local Area Networks
Creation & Composition
Word processors
Microcomputers
CAD/CAM
Synthesizers
Assimilation & Use
Decision support systems
CAD/CAM
Graphics

SECTION 4

CREATORS & COMPOSERS OF INFORMATION

There are several distinct kinds of creators and composers of information. At the one extreme, are those who create as a vocation including some authors, inventors, songwriters, playrights, and so on. The income of these creators depend on royalties, income from licences or selling rights to their works or inventions. At another extreme, are those who create largely out of love or enjoyment of doing so, and who are not particularly looking for a source of income. Another extreme are those who are paid to create or whose job it is to create or invent and composition for publication is also considered part of their job, or at least it is done to further one's career, achieve recognition and so on. Many scientists, engineers, researchers, and other scholars fall into this category.

Within these professions, the attitude of individuals towards publishing their works and protection of intellectual property varies substantially. For scientists and engineers, for example, their creations or inventions are ofter considered proprietary if they work for a company; whereas, if researchers work for a university or are funded by public grants, they are expected to publish. In fact, these are the reasons that fewer than 10 percent of scientists and engineers write journal articles. Over 75 percent of the authors of scientific and technical articles are employed by universities or the government, while only about 30 percent are employed in private organizations. Over 85 percent of the research and development projects leading to articles were largely funded by the government, education institutions or nonprofit institutions. It is emphasized, however, that non-authors read nearly as much as authors. [1]

There has been some misunderstanding concerning the amount of publishing, at least in science and technology. It is a fact that all of the recorded scientific knowledge known to mankind doubles about every 15-20 years. However, this amazing growth actually reflects mostly the growth in the number of scientists and engineers. In fact, the number of books published per scientist and engineer has actually decreased some in recent years, although the number of articles published per scientist and engineer has increased about 25 percent over the past 20 years (i.e., from about one article per nine scientists in 1965 to 1.25 articles per nine scientists in 1984). However, there are many more authors, because there are more authors per article (i.e., co-authors) now than in 1965. [1]

Creators and composers have two major concerns about their work and protection of the intellectual property. The first concern is one of plagiarism. On the one hand, creators publish to have their work read and cited. In fact, analysis of citations is almost a business in its own right in that such analyses have been used to judge the scholarly merit or contributions of individuals and institutions (as well as the quality of journals). Sometimes, scientists and other scholars publish their work specifically to establish their creation, particularly in competitive environments such as medicine. Patents provide similar protection for inventions. The second major concern involves monetary return for the effort invested. This concern involves mostly those who create as a vocation or those who expend a great deal of time and effort composing their work, such as in writing books. Authors of journal articles are rarely paid in any way for their works, even though they average about 80 hours writing each of their articles. [1] In fact, they often pay to publish their articles in some form of page charges. (This is discussed in the next section). Both concerns (plagiarism and monetary return) require some form of protection in order to ensure that the investment by creators is protected. However, it is possible that the laws necessary to protect in terms of the two concerns may have to be different in the future in light of new advances in technology.

Garvey and colleagues [9] have pointed out that scholarly works are subjected to a number of processes before they reach formal publication, such as journal articles and then books. Prior to that time, they may be reported in interim technical reports, colloquia (or classroom) in one's own institution, professional conferences (both oral and published) and final technical reports. Manuscripts for articles are sometimes distributed among colleagues prior to submittal for publication. All of these activities, and the feedback obtained, tend to help authors improve their creation and, sometimes, new co-authors come into the picture. This phenomenon may be enhanced considerably by new technology. At the present time, many written works are prepared by electronic word processing. In science and technology, the preparation of journal article manuscripts prepared by word processing or text editors increased from 40 percent in 1975 to about 70 percent in 1984 and should increase to nearly 100 percent in a few years. [1] This means that many authors have the capability of communicating their materials electronically to colleagues or publishers. Article manuscripts can be reviewed informally much faster, but this also presents more of a potential problem of plagiarism or protection of intellectual property since, with either electronic mail or teleconferencing, it is not too difficult to get access to materials. This technology will also likely lead to explicit knowledge bases where multiple authors contribute to state-of-the-art updates or provide updated answers to specific questions or issues (see discussion in Section 8).

Such electronic systems for creating and composing information may result in questions of ownership. A recent example has been original cataloging input by libraries to bibliographic utiltities. Libraries have grouped together to argue that they, not the bibliographic utiltities, own the intellectual property so that the bibliographic utilities cannot dictate or make policy concerning royalty payments, constraints on downloading and so on. (This issue is discussed in more detail in Section 8.) As more multiple authors contribute to explicit knowledge bases, the same questions of ownership are likely to arise. Another very important issue that is likely to arise because of this new technology, is accuracy and precision of input, particularly of content and structure. There are those who argue that informal distribution through the electronic processes reduces the need for formal review or refereeing. Furthermore, some predict that less of the information that is now published will actually be formally published because of the potential for direct electronic distribution among peers. At least information distributed in this way might be accepted and used before formal referencing takes place. It would seem this is likely to happen only if there is some formal acknowledgement or recognition for information distributed in this manner. Such formal acknowledgement and recognition also helps ensure that quality of contributions by multiple creators and composers, since poor quality would be attributable to an individual.

Returning to the initial classification of creators and composers, it seems that some means of protection against plagiarism is necessary, regardless of the motives or financial incentives of the creators. For example, this would be just as necessary for works created under public funding or as part of one's work as for those whose vocation is the creations of works. Otherwise, less information would be composed and made available for others to use which is vital for some fields such as medicine and science. It is less clear that protection is necessary for financial returns to the creators which involve works not prepared for vocational reasons; that is, where incentives are more for recognition, career development or scholarly love. One of the important roles of publishers is to provide a mechanism for protecting against plagiarism and for financial reward through royalties. This role may become even more important with introduction of new technology.

SECTION 5

PUBLISHERS

As mentioned in Section 2, publishers perform (or are at least responsible) for editing (transformation), recording and reproduction and distribution (communication) of a significant proportion of recorded information. These functions help ensure the accuracy, precision, currency, accessibility and availability of information. Editing is done to improve information content, and information format and structure. Recording, reproduction and distribution helps accommodate user requirements satisfied by paper and microform media. Publishers also perform an important role by seeking out or identifying creators and encouraging them to publish their works at the one end of the information transfer process, and creating and establishing a market for information use at the other end. Finally, as mentioned in Section 4, they also contribute by formally applying for copyright protection for themselves and on the behalf of others (as a protection against plagiarism).

Part of the reason that publishers need protection against others taking and distributing their materials is that they incur a substantial one-time fixed cost for editing, recording and marketing (to potential authors and buyers). This large investment is particularly important with books because the risk of loss is greater than with journals because costs of publishing books are incurred in anticipation of revenue. Whereas with journals the subscription revenue is derived prior to incurring much of the cost. The prerun costs of books can range up to anywhere from $50,000 (for scholarly books) to $500,000 (for popular books) prior to making a single sale. Thus, there is a substantial capital investment made wth corresponding risks. Similarly, prerun costs of journals are very high. For example, they average about $120,000 annually per title for editing, graphics and composition alone. [1]

Typical cost per copy for a scholarly book (not including the prerun cost) is about $5 to $10. Since the average sales of scientific and technical books (not educational text-books) is less than 2,000, publishers must keep their fixed costs to a minimum in order to reduce risks of large losses. For example, suppose that a book is priced at $40 and only 1,000 copies are sold. If the initial print run is 2,000 at $10 per copy, the publisher would lose roughly $30,000. Yet, if the sales was 4,000 the profit could be as much as $70,000. Thus, there is potential for large losses as well as large profits. It is often said that scholarly book publishers count on a few very good books (sellers) to cover many losing books. The economic picture is somewhat different for journals because they derive their revenue largely from subscriptions (and advertising) which are paid before most expenses are incurred; particularly, after a journal is well established.

With journals a typical or average reproduction and distribution cost is $10-$15 per annual subscription. Assuming an average of 6,000 subscriptions (for science and technology journals), the annual subscription price would have to be at least $35 to break even. Nearly 60 percent of the costs are prerun costs. If the circulation was 1,000 (and nearly one-fourth of the journals have less than that number) the prerun costs would be nearly 90 percent of the costs (all other factors remaining equal). It is clear that the fixed prerun costs are very important for both book and journal publishers. This reason alone requires publishers to protect this investment against others' copying and distributing these copies at the expense of book or journal subscription sales. The problem is more acute for journal articles than books because one can photocopy journal articles less expensively than purchasing an entire subscription. Whereas, one usually cannot photocopy a book less expensively than purchasing it. However, in the latter instance delays in responding to orders by publishers caused by the IRS ruling on backlogs of copies has made photocopying of entire books more attractive.

There is tremendous pressure on publishers to reduce prerun costs. Such pressures can result in reducing refereeing or editing which can lower overall quality of information content, format and structure. On the other hand, technology has helped reduce the recording costs. To begin with, computerized photocomposition was less expensive than typesetting. Now, with authors composing and recording in electronic media through word processing equipment, there is the potential of directly inputing text from word processing to photocomposition. This largely avoids rekeyboarding the text. (OCR has also been used with moderate success to reduce input costs.) The problem with direct input from word processing is one of compatibility. There are basically three ways that incompatibility of word processing can be overcome. The first way is to require authors (and/or word processing vendors) to standardize their processing. The AAP has an ongoing experiment which will determine the feasibility of this approach. (Note that this project only addresses compatibility at the textual level and not at the character representation or file structure levels which relate to machine compatibility.) Another approach would be for the publishers to convert the input to their own computer format and structure, although this would potentially require a large number of conversion programs (because of the variety of computer systems used by authors). Perhaps, services will evolve that can perform such conversions less expensively than current practice. Such services would provide conversion facilities to a large number of publishers.

Another approach that professional society publishers have used to overcome large prerun costs is to charge authors for part or all of the prerun cost of publishing their articles. Such charges take the form of page charges (charged for 38% of all scientific and technical articles), reprint or preprint fees (20%), submission fees (4%) or revision fees (3%). The average amount of such fees is about $340 per article. [1] The authors often obtain reprints of their articles which they use to distribute to colleagues and libraries on request. Many of the professional societies that charge authors, do so at an amount that will pay for the prerun costs and the cost of the reprints. In this way they only incur costs for reproduction and distribution. This policy presents an interesting economic trade-off for these publishers since subscription prices and page charges are highly interdependent. The number of journal subscribers is a function of the price, the quality of articles and availability of separates. Lower subscription price should increase the number of subscribers; the lower price of which is accomplished through page charges. Yet charging authors also may reduce the number of them willing to pay or the quality of manuscripts submitted, thus counteracting the number of subscriptions gained through lower price. Also, distribution of reprints has some potential for reducing the number of subscriptions since they compete with subscriptions. Our studies of the price elasticities provide some evidence that society publishers actually serve their members better by charging authors and passing on the difference in prerun costs to the subscriber/members. The number of manuscripts lost by author charges is not enough to overcome the increased amount of revenue generated from the two sources (page charges and subscriptions). [1,10]

Commercial publishers of journals seem to have taken another approach. Generally in the past eight years, commercial publishers have increased their prices at a greater rate than society publishers. When publishers have a single price (to individuals and institutions), this has had the effect of substantially reducing subscriptions by individuals but only slightly by libraries. Our studies clearly show that price elasticity is far less sensitive for libraries than for individual subscribers. Further evidence of this is borne out by the way in which individuals and libraries seem to consider the alternative approaches to acquiring their information. [1,10]

Studies have shown that the following factors largely explain whether or not an individual scientist will subscribe to a journal that is important to them: proportion of articles read from the journal, subscription price, whether journal is an association (i.e., professional society) journal and amount of out-of-pocket expenditures for information products. Also important was availability of the journal in a conveniently located library. [5] Scientists and engineers have indicated that their library would be the most likely source (80%) for a journal article, if they did not have a personal subscription. [1] Empirically, it is found that it is less expensive to subscribe to a $40 journal than to rely on getting articles from a library located about 10 mintues away, if the scientist reads more than about five or six articles per year from the journal. Otherwise, it is less expensive to go to the library to read the articles.

However, if the price of the journal increases to say, $150, the break-even point increases to nearly 20 readings per year. That is, it would take at least 20 readings in the $150 journal to make it worthwhile subscribing to it. [1] We find that the actual distance (in time) to the library makes a great deal of difference in the extent to which it is used. [3] Furthermore, the proportion of articles read by scientists from library journals has doubled between 1977 to 1984. The major change has been in reading or browsing through current issues of journals. In 1977 a much larger proportion of the reading of library journals came from materials over two years old. It is believed that the dramatic trend of current reading from library journals is due to the large increases in price, particulary by commercial journals. [1]

Libraries also have a trade-off of purchasing books or journal subscriptions versus obtaining the books or journal article copies from other sources, such as interlibrary loans or a document delivery service. With a typical scientific journal, the breakeven point is about 20 readings of an annual subscription of a journal. In academic libraries about 55 perent of the journals have fewer than this number of readings. If the price were increased by 50 percent the break-even point would increase to about 27 readings and an additional ten percent of the journals would fall below the break-even point. [1] We believe that the break-even points are the same or similar for special libraries but that there are fewer journals that fall below the break-even point than in academic libraries. The reason is that academic libraries have a different perspective in which collection size is very important to accreditation and their patrons tend to expect more complete collections.

Technology is having a significant effect on the individual versus library trade-off as well as library purchasing versus borrowing. To begin with, online bibliograhic searching and other methods of identifying and locating needed information has meant that fewer readings came from one's personal subscription to journals since a broad range of journals are identified through this mechanism. This, combined with increased journal prices, has meant that library journals are used more frequently by individuals than in the past. Secondly, new technology has meant that interlibrary lending and document delivery services are both less expensive than in the past and articles can be ordered more rapidly through online ordering. The cost has fallen because union lists of serials, OCLC and other library cooperative technologies have led borrowers quickly and accurately to journal sources. Ten years ago it was not at all uncommon to request from two or three libraries before a copy of an article could be found.

Now less than one out of ten times does a library request an article that is not available. [11] About 30 percent of article copies requested through libraries are "rush" orders (i.e., required within one or two days). [1] Trade-off analysis shows that, for these requests, speed of delivery dominates over other factors such as price, reproduction quality or availability of special graphics. [11] For these reasons, several library cooperatives and document delivery services have begun providing article copy access through facsimile transmission at a significant increase in price.

We have predicted over the next ten years that there will be a significant amount of single article copy distribution by electronic media but that few, if any, journals will become entirely eletronic; that is, totally electronically composed, recorded, communicated, stored and accessed. [1] Electronic journals in the near future are technically feasible but not economically feasible. Journals that are frequently read by individuals or in libraries will be less expensive on a per reading basis than the same number of articles per journal processed electronically. However, new technology will mean that many more of the readings from journals infrequently read by individuals or collectively in libraries will come from electronically accessed articles. It also means that there will be fewer journal subscriptions in the paper medium. An iterative economic analysis suggests that an equilibrium point would be reached with about 30 percent fewer annual subscriptions to journals. This includes a royalty to the publisher for single article copies delivered electronically. The amount of the royalty that optimizes extent of reading and achieves the current amount of net revenue to publishers is found by equalizing the cost per reading over subscriptions and single article copy distribution. Thus, the royalty varies substantially by amount of reading. [1]

One possible deleterious effect of the increase in single article copy delivery is that there will be an unbundling of articles. That is, journal issues will be more precise, or cover only very specific specialities. Articles that are likely to be infrequently read will be more carefully scrutinized for inclusion in journals, even though they may be of high quality or value to readers. Some mechanism must be found to provide these articles, even if they are distributed only electronically at a higher price.

Another area that offers great opportunity to publishers is the potential for publications on laser digital disk and video disk. Publishers have already begun to develop products based on these new technologies. Once publishers do make documents available on disk libraries, information centers, clearinghouses and end users will not only have to be able to handle the new forms but will also have to make the equipment to use them available to their user communities. Publications available only in disk media will only be accessible to those who own or otherwise have access to the necessary equipment, unless provisions are made to convert them into another medium.

SECTION 6
LIBRARIES

Libraries have, for centuries, been considered the traditional source of recorded information. The traditional book and document-oriented library has survived extremely well as an institution with relatively little change in terms of scope and mode of operation, until very recently. There are today well over 56 thousand libraries in the U.S. They can be organized into four major types as follows:

Public	9,000	
Academic	5,000	
Special	17,000	
School	unknown	(25,255 is a lower-bound estimate)

There are approximately 9,000 public libraries and approximately 6,200 public library branches. Academic libraries include university libraries, community college libraries, junior college libraries, etc. and number approximately 5,000. Special libraries are the fastest growing sector of libraries and include special academic, corporate, federal, medical, law, scientific and technical libraries, etc. Currently, there are estimated to be over 17,000 such libraries in the U.S. The number of school libraries is more difficult to determine, especially as there are numerous definitions of what constitutes a library. (Definitions can be based on collection size, facilities, number and qualifications of personnel, etc.). There are approximately 11,700 public school districts in the U.S., within which there may be several libraries. In addition, there are approximately 14,000 private schools in the U.S., many of which have their own libraries. Thus, the true number of active libraries in the U.S. is unknown but is over 56 thousand.

Libraries play a unique and important role in suporting the information needs and requirements of their user communities. They act as intermediaries between the body of recorded knowledge and their users. They provide access to information (in many different forms) that is relatively infrequently used by individuals but relatively frequently used collectively by their user communities. A major shift in the philosophy of librarianship is occurring in all types of libraries from the provision of services on-demand to a more proactive anticipatory approach. Libraries are concerned with providing needed information services to their constituencies. Unfortunately, library budgets have not been able to support large-scale development of this approach to library service and progress is very slow and cautious. This is necessary so that patron expectations are not raised to a level which is impossible to meet.

The services offered to the various communities include the identification, location and physical delivery of information to that community from both the libraries' own collections, and their "extended" collections via networking. The end product of the service can take a variety of forms: a book; document; tape; a reference; an answer; a referral to another source; etc.

Although the different types of libraries are similar in many respects, there are some important distinctions. These distinctions typically revolve around the different user communities served, and their particular needs and requirements.

Public libraries serve communities defined by geographic boundaries which are often tied to the funding base for libraries. Public libraries can serve all the residents of a state, county, city, town, etc. Some libraries are given funds (from different sources) to provide additional services, for example, to provide interlibrary loan and reference services to a region, or to provide a complete set of services to a municipality without its own library. Public libraries generally derive their funds from some form of tax dollars. Thus, library services to the designated (primary) user community are generally provided at no charge to the user. However, this tradition is beginning to change (see Section 5 for discussion).

Funding for academic libraries are derived from the parent institution usually on a per capita basis. The main concern of academic institutions in maintaining their libraries is their role and contribution to accreditation. Thus the academic institutions, like the public libraries, are required to maintain standards for collection size and staff size as part of the accreditation process. Community college libraries often function as public libraries particularly in communities with no public library.

Special libraries, like academic libraries, derive their funds from their parent institution but do not have to conform to externally imposed standards. In some cases special libraries charge-back to departments/divisions for services rendered, although the ultimate source of funds remains the same.

School libraries are funded through the state Departments of Education in the case of public schools, and through private funds in the case of private schools. As with academic libraries, standards relating to collection size and staffing are generally imposed as a requirement for receiving state funding.

Library budgets are typically calculated on a per capita basis. In addition to materials budgets, library budgets have kept fairly constant the number of librarians per 10,000 constituents served. This trend is demonstrated in Figures 6 through 10.

The number of public librarians for 10,000 population has increased since 1960 from 0.9 librarians per 10,000 to 1.34 in 1982, although as shown below this number appears to have levelled out over the four most recent years for which data were available.

Similar results are observed for school librarians. In public schools the number of school librarians per 10,000 constituents in 1970 was about 9.1 and this number increased to 13.2 in 1981; again with the last four years about level.

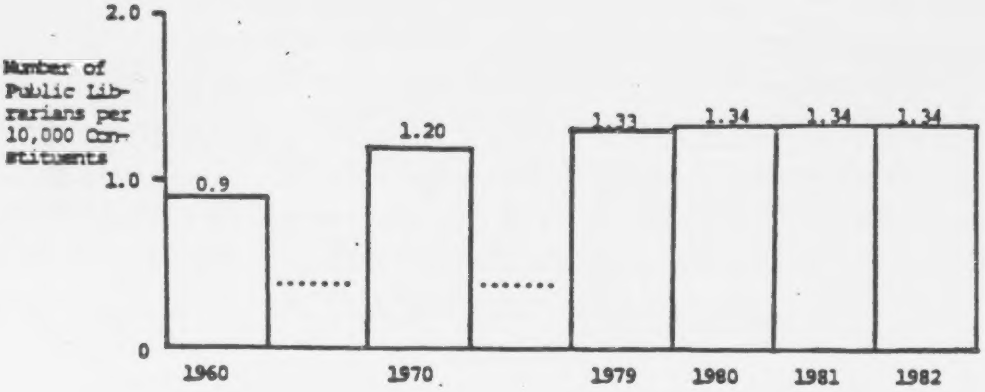


Figure 6

Number of Public Librarians per 10,000
Constituents Served (1960, 1970 and 1979 - 1982)

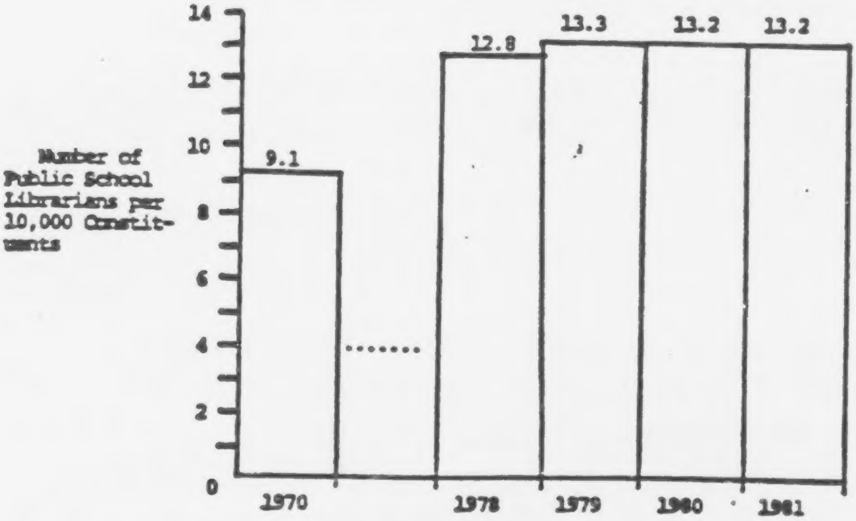


Figure 7

Number of Public School Librarians Per 10,000
Constituents Served (1970 and 1978 - 1981)

Since public and school libraries are funded through public funds, it may be that the funders have generally funded the two types of libraries based on number of constituents served, or at least allocated library positions on this basis. This assertion, of course, ignores two factors: the increased requirements of libraries and the fact that some communities and many schools simply do not have libraries.

Private schools have over twice as many school librarians per 10,000 constituents and experienced a slight increase in this number from 1978 to 1981.

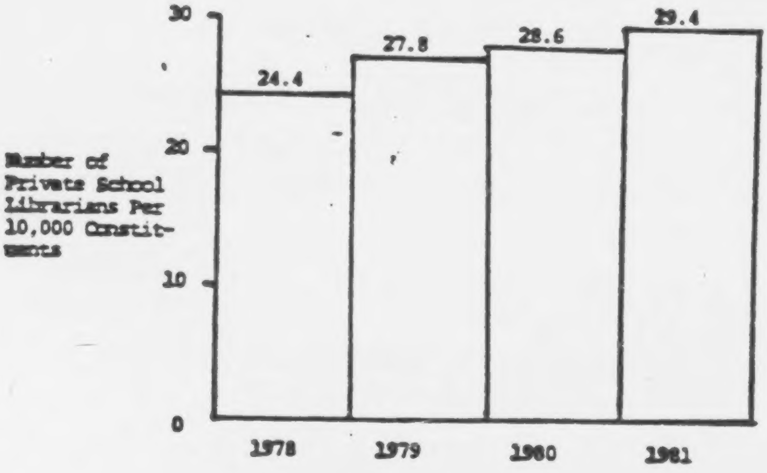


Figure 8

Number of Private School Librarians Per 10,000 Constituents Served (1978 - 1981)

One could argue that private school funds are greater or that there is a greater appreciation of librarianship in private schools. However, another factor may be that the ratio of elementary to secondary students is lower in private schools (i.e., there are proportionately more private high schools than elementary schools).* There are relatively more (and larger) libraries in high schools than in elementary schools.

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* There are about three private elementary schools to one private high school and slightly less than two public elementary schools to one public high school.

Academic libraries have three major constitutencies; students, instructional staff and full-time research staff. The ratio of academic librarians to these three constituencies has remained almost constant over the three or four years for which comparable data are available. The number of academic librarians per 10,000 students is shown below:

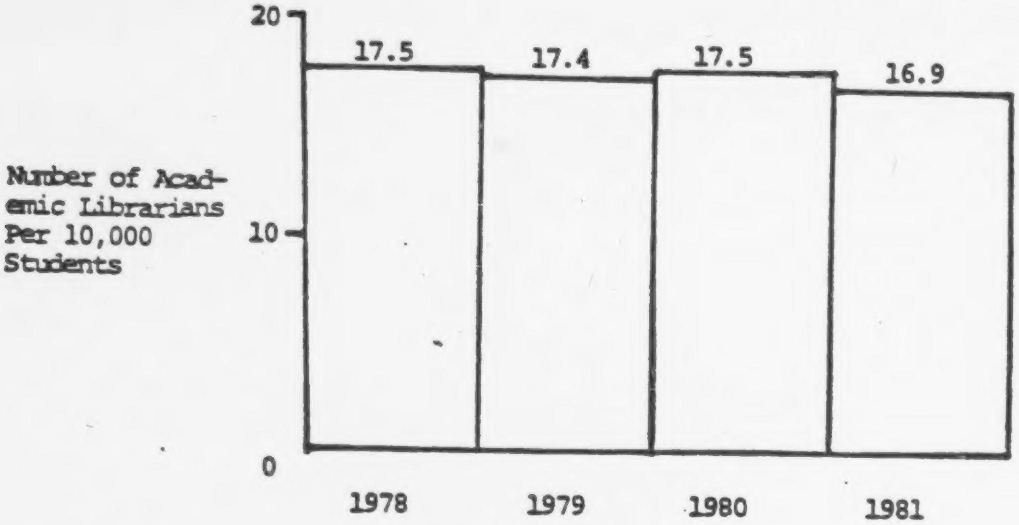

Figure 9

Number of Academic Librarians Per 10,000
Students Served (1978 - 1981)

There appeared to be a slight decrease in the number of academic librarians in 1981 compared with number of students. However, when compared with full and part-time instructional staff, the number was 246,247, and 243 librarians per 10,000 staff in 1978, 1979, and 1980 respectively. Over the three years the number of scientists and engineers ranged from 2,590 to 2,610 per 10,000 scientists and engineers*.

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* Note that there is overlap between instructional staff and scientists and engineers employed at universities and colleges.

There is no perfect way to characterize the constituents of special libraries because special libraries cover such a range of types of libraries such as in hospitals, research laboratories, businesses and law firms. If we use the number of persons employed in professional, technical, and managerial and administrative occupations as a reasonable categorization of the special library constituents we find that the number of librarians per 10,000 constituents is decreasing very slight from 1978 to 1981.

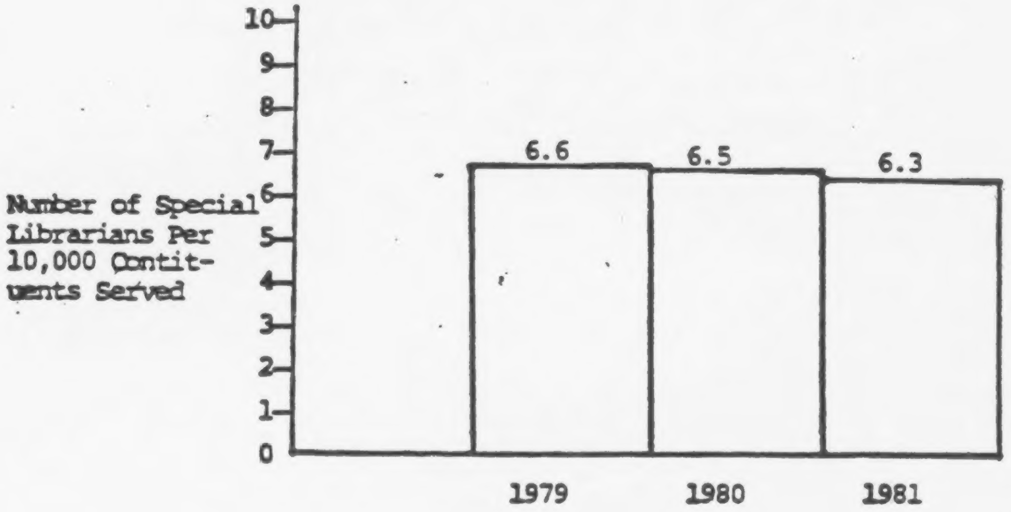

Figure 10

Number of Special Librarians Per 10,000
Constituents Served (1978 - 1981)

It appears that the substantial growth in number of special librarians merely reflects the equivalent growth in their constituents served.

While this type of formula worked well in the past it does not take into account several significant aspects of library service:

- Libraries provide access to an ever-increasing accumulating body of recorded knowledge. This body of knowledge is estimated to double approximately every 17 years. One of the main roles of libraries is to provide access to older information.

- Libraries are also providing access to information in many different forms included print, audio, video, electronic, etc. As information is captured and distributed in non-print forms, libraries must not only provide access to the information packages (audio tapes, videotapes, compact and optical disks, etc.), but they must provide access to the equipment necessary to gain access to the information that is captured (tape and disk players, computers, etc.). This trend is becoming increasingly important as new technologies emerge.

- As a result of the widespread availability of various information handling technologies (microcomputers, VCR's, etc.) information users are much more aware of the range and variety of information resources. Information users who have direct (and indirect) experience of using these new technologies have become much more sophisticated in their demands for information and in their expectations of the services provided through libraries. Thus not only do they use libraries more, but they are more intensive and demanding in their use.

- Library personnel (the numbers of which tend to reflect fairly consistently the number of designated constituents served) are feeling the pressure of these increased demands and ever-expanding information base and are looking to ways of coping with the additional loads. Potential solutions (discussed in more detail elsewhere) include networking and resource sharing, automation, stress-reduction workshops (rated the most important C.E. requirement in a recent ALA poll and confirmed by King Research, Inc. in the New Directions in Library and Information Science Education project along with the need for CE courses in information technologies, library automation and library management).

The one development in the library community that has begun to recognize the changing demands on libraries is the gradual shifting of library performance evaluation from standard "input measures" of number of titles, volumes, staff per constituent, towards the recently initiated development of "output measures" of service transactions per constituent. However, library standards to date are still largely based on input criteria. The output measures are fairly recent [12] and not universally accepted, nor sufficiently developed and understood as criteria for standards development.

Traditional or "basic" library services are generally provided "free of charge" to the designated user communities. Recently, however, a trend has emerged in public and academic library environments to charge a subscription fee to users falling outside the designated constituency. Such fees vary from $10 up to approximately $50-100 per year. In response to a wave of subscription arrangements for non-constituents' users of a library, there has been a move in some states (such as California, Pennsylvania) to reimburse or compensate libraries that provide direct borrowing and other services to "external" users. Such state derived funding is often used to reimburse or compensate both public and private libraries for services rendered.

As mentioned above, libraries are faced with providing access to information in many different forms, and to increasing numbers of non-print materials. To some extent the libraries must respond to the technological developments in the publishing community, and the use of new information technologies by libraries is more likely to be driven by the publishers and library users, than by a need to make library operations more efficient.

A number of important issues arise as a result of information technologies and may effect libraries, their roles, services and users:

- To access information captured in various non-print forms requires users to have access to the equipment needed to "uncapture" it. While such equipment should be provided in libraries, it may not be avaiable in the home or workplace, thereby restricting access to the information. This restriction of access could result in loss of use and, therefore, loss of value of the information to the user.

- Many of the information products available today are available only in non-print form. This makes the issue described above even more critical unless facilities are made available to the user to convert the information into print form.

- Related to the two issues above is the need for librarian and user education and training in the use of the equipment needed to access non-print information; this education and training will be necessary on a continuous basis, particuarly if use is infrequent. If education and training are not provided, certain groups of potential users will be cut-off from a body of recorded information.

- Information captured in electronic media and accessible through readily available, low cost devices such as microcomputers, VCR's, etc., can be copies in its entirety with relatively little effort on the part of the user. This has been the cause for considerable concern on the part of the publishers of electronic information. The issue is no different from the photocopying issue, but it is the scope of the issue in the case of electronic publications and databases that has fuelled discussions and debates.

Recent advances in technology have led to significant improvements in performance and reductions in the cost of automated library systems. As a result, three trends have evolved which are seriously affecting library services. These trends are:

- Successive improvements in the capabilities of data processing equipment available at steadily decreasing prices;
- Rapid increases in the number of information processing organizations developing new information products and services; and
- Large-scale increases in the numbers of machine-readable bibliographic databases used by libraries.

The traditional role of the library in terms of the materials handled and mode of operation is continually changing as a result of technological change. The main effect of this change as far as libraries are concerned is the availability of more sophisticated, more reliable, more efficient and less expensive information systems, services and products which assist libraries in managing and organizing their own internal operations (supporting acquisitions, cataloging, catalog production and maintenance, serials control, circulation, etc.)

Two types of capabilities have evolved based on computing technologies (both hardware and software) and related communications technologies. They are:

- Bibliographic services or utilities
- Automated library systems.

Each of the two types has a role to play in changing library environments. Rather than compete, the two are mutually supportive and complementary, although the boundaries between them are blurring. The bibliographic services have traditionally supported online searching, shared cataloging and catalog production but have begun to move into other application areas, such as acquisitions, serials control and interlibrary loan (and, very recently, into document delivery). The automated library systems serve the needs of individual libraries, library systems, and groups of cooperating libraries, and support the functions of circulation, online catalog access and maintenance, serials control, acquisitions and management reporting. When first introduced into libraries these systems were dedicated to a single function as stand-alone (self-contained) systems. Today, systems are being developed which combine many of the different functions. The systems of the future will be fully integrated systems.

Recently, a third automation option has emerged combining some of the features of bibliographic services and automated library systems. This option consists of an automated library system which is shared by groups of libraries on a time-sharing basis. This service is likely to become a popular automation solution for libraries because no single library bears the full burden of cost (of either hardware or software), because each library pays only for what it uses (either in terms of the amount of storage or amount of computer time used, and telecommunications) and, finally, because the libraries sharing the system can potentially share their databases (in the same way that the bibliographic utility subscribers do) to support online cataloging and interlibrary lending and borrowing.

The prevailing trend for the development of library software is total integration. A truly integrated system implies that information to be stored is input only once even though it may be used in many ways for different applications, and that system-wide functions such as monitoring, access control, indexing, editing, sorting and searching are implemented only once.

These systems offer various combinations of the following functions:

- acquisitions
- cataloging and catalog production
- online catalog access
- circulation
- serials control
- management reporting

Most of the modules are used only by a librarian but recently library patrons have been allowed to access bibliographic and catalog information.

The "online public access catalog" feature available on some systems today is a relatively new application of these systems. It enables the patron to search the library's database through the use of author names, titles, and subject headings at a minimum, and to display library holdings in a format similar to catalog cards. Furthermore, it gives the patron current status information, e.g, whether an item is out on loan, on order, etc.

Interaction with these systems varies according to the function that is being performed and on vendor offerings. Typically librarians interact with the system using a keyboard terminal, and some form of optical input device such as a light pen or OCR wand for circulation applications. Patrons, on the other hand interact with the catalog access module using either a keyboard terminal or a touch-sensitive display screen. No fully integrated system is available to libraries today. Systems do exist which integrate some of the functions. Other systems perform multiple functions but are not fully integrated in the sense of having a central master bibliographic file.

The library software market involves the following major categories of services and products:

- Bibliographic utilities
    - online searching of databases
    - shared cataloging plus related library support
- In-house (or shared) integrated automated library systems

The growth in the number of online searches performed over the last decade has been phenomenal. If we consider bibliographic database searching alone, in 1974 over 700,000 searches were performed on fewer than 300 databases; by 1982 over 8 million searches were performed an over 1,000 databases as shown in Figure 11. Non-bibliographic databases have proliferated at an even faster rate than bibliographic databases. It is estimated that over 600 numeric databases are commercially available, and that approximately five times as many numeric database searches as bibliographic database searches are performed per year. This would result

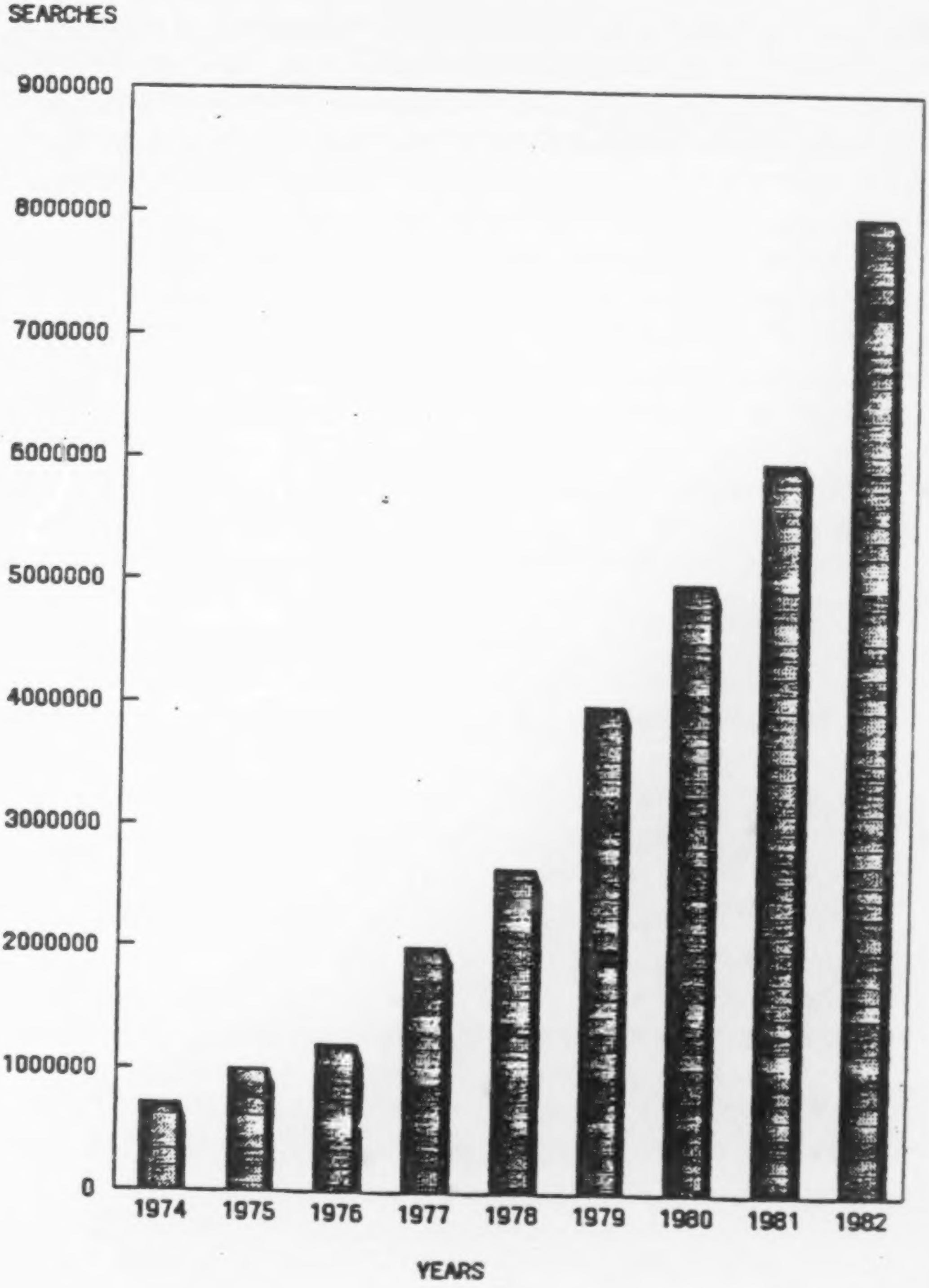

Figure 11. NUMBER OF ONLINE SEARCHES OF BIBLIOGRAPHIC DATABASES, 1976-1982.

in approximately 48 million searches performed per year. These statistics do not include searches of cataloging databases (such as those of OCLC, RLIN, WLN, UTLAS, etc. which are discussed next).

The major online search services in the U.S. are Lockheed's DIALOG, System Development Corporation's ORBIT, Bibliographic Retrieval Service's BRS, and the National Library of Medicine's MEDLARS. Data on market share by vendor are not generally available. DIALOG currently offers 220 databases, BRS 91 databases, ORBIT approximately 75 databases and MEDLARS 20 databases. Recent service enhancements include online document ordering, electronic mail, storage and retrieval of search protocols, cross database searching, etc. The vendors also have begun to make arrangements for delivery of documents either electronically or using more traditional means.

The number of libraries subscribing to the cataloging utilities (which support other operations such as interlibrary loan, acquisitions and serials control) has also grown dramatically over the last 10 years as shown in Figure 12. The number of members subscribing to these services grew from approximately 43 in 1982 to approximately 4,000 in 1983. These numbers reflect the number of actual subscriptions and underestimate the number of libraries using the services because of cooperative and consortia memberships which cover multiple libraries. As mentioned earlier, there are over 56,000 libraries in the U.S. comprising approximately 9,000 public library systems, 5,000 academic libraries, 17,000 special libraries and over 25,000 school libraries. Thus the market penetration of cataloging utilities is approximately 7 percent. If one considered the primary market for these services to be public, academic and special libraries, the market penetration would be approximately 13 percent.

The three major cataloging utilties in the U.S. are OCLC (Online Computer Library Center), RLIN (Research Libraries Information Network operated by the Research Libraries Group), and WLN (Washington Library Network operated by the Washington State Library). OCLC has by far the largest market share as indicated in Figure 13. One other vendor of shared cataloging and related services is UTLAS (University of Toronto Library Automation System) which is based in Canada.

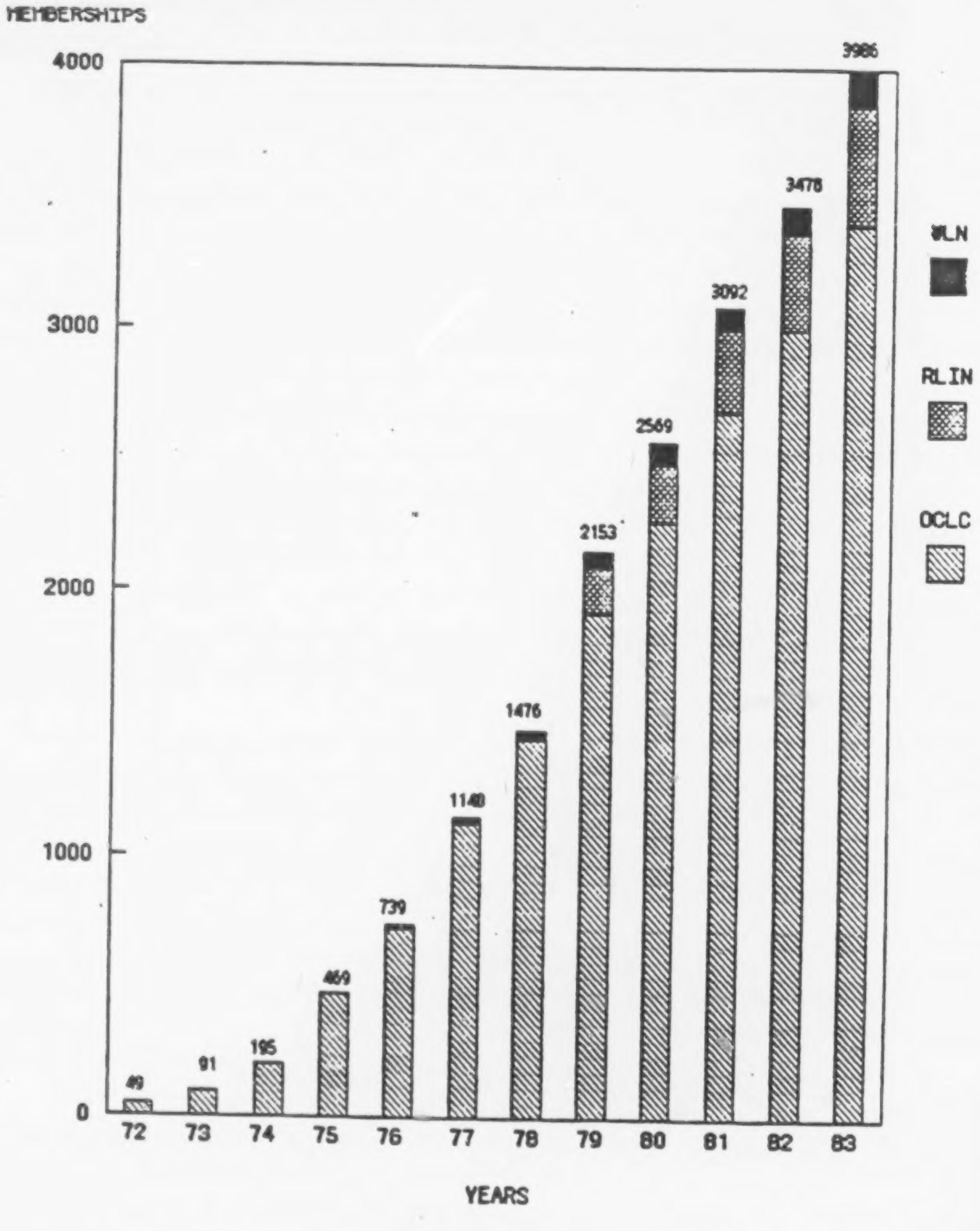

Figure 12: MEMBERSHIPS OF CATALOGING UTILITIES; 1972-1983.

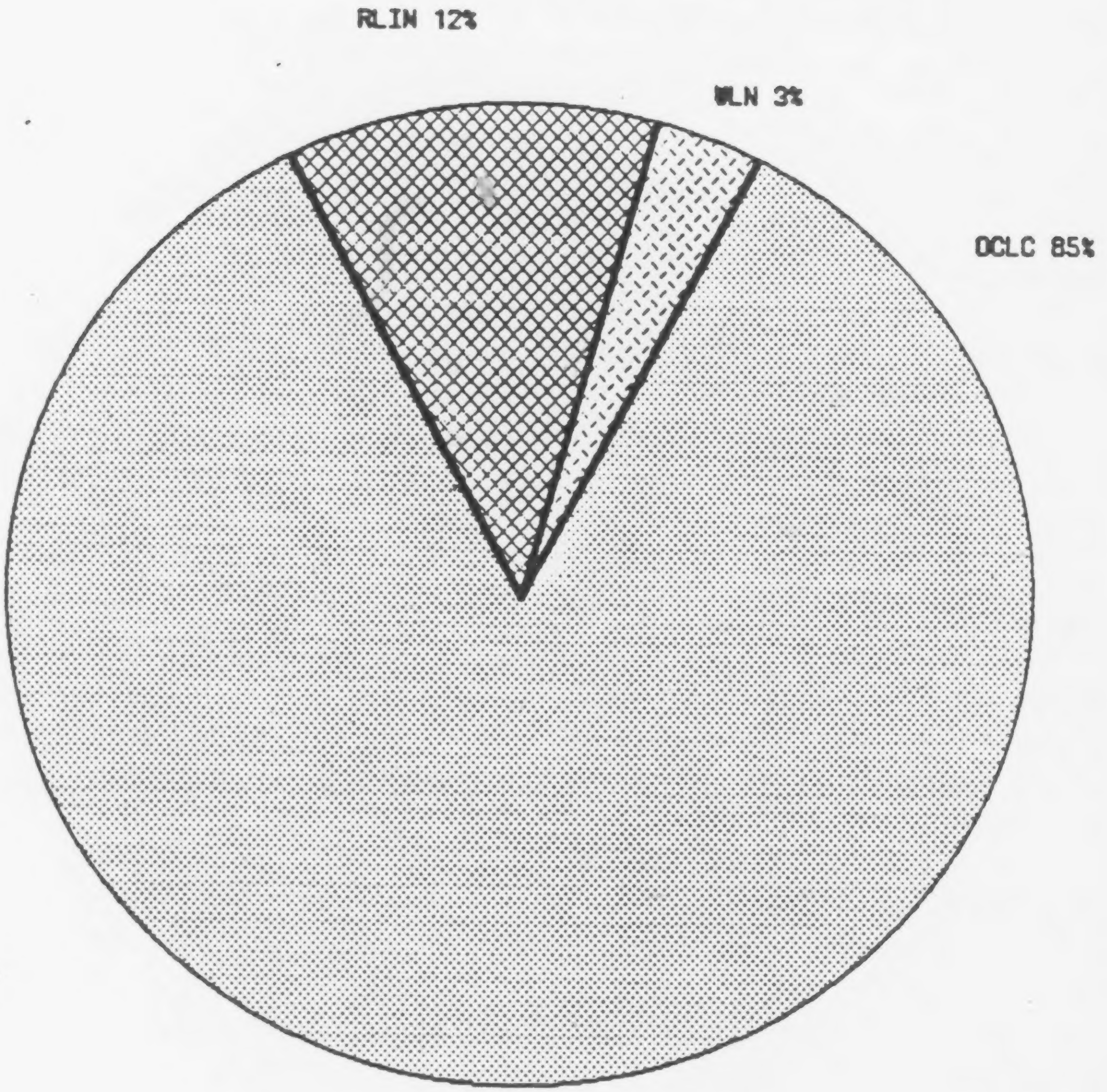

Figure 13: MARKET SHARE OF CATALOGING UTILITIES IN 1983.

The availability of electronic databases and the ease with which they can be searched and large portions copied (downloaded) is cause for cooncern among the database producers and distributors (see Section 8 for further discussion). Libraries too are attempting to protect their investment in inputting to shared databases (particularly the cataloging utilities). An example of this is the application for co-ownership of the OCLC database by AMIGOS and SOLINET on behalf of their member libraries. Libraries belonging to other networks and cooperatives are now looking to share automated library systems and, therefore, share databases among themselves. Libraries which have to date not converted their records to machine-readable form have the potential (or at least from a technical perspective if not legally) to use other libraries' databases, regardless of how they were generated. Although some of this "third party" use of records is allowed on small scale (permission being granted on a per project basis by the utilities) there is considerable concern about potential effects if adopted on a large scale. The main concern of the utilities is that if the major libraries that have virtually completed conversion withdraw from participation in the utilities. The critical mass of subscribers necessary to making the utilities a viable service may erode to the point where collapse is inevitable. The main concern of the libraries is cost to use the utilities (particularly as telecommunications costs are increasing).

The growth of the application of automated library systems by libraries (either individually or in groups) shows similar patterns, as displayed in Figure 14. At the beginning of 1984, 520 libraries had installed commercially-available automated library systems, of which 111 (21%) had actually been installed during the previous year. The most prominent vendors are CL Systems, Inc., DataPhase Systems, Inc., Geac Computers, and Library Systems and Services. The first three of these vendors market integrated library systems supporting multiple functions, developed to varying degrees. Library Systems and Services market a more specialized product, MINIMARC. This is a turnkey microcomputer-based system supporting cataloging. It uses floppy disks, and very recently optical disks, to distribute the LC MARC database on a regular basis.

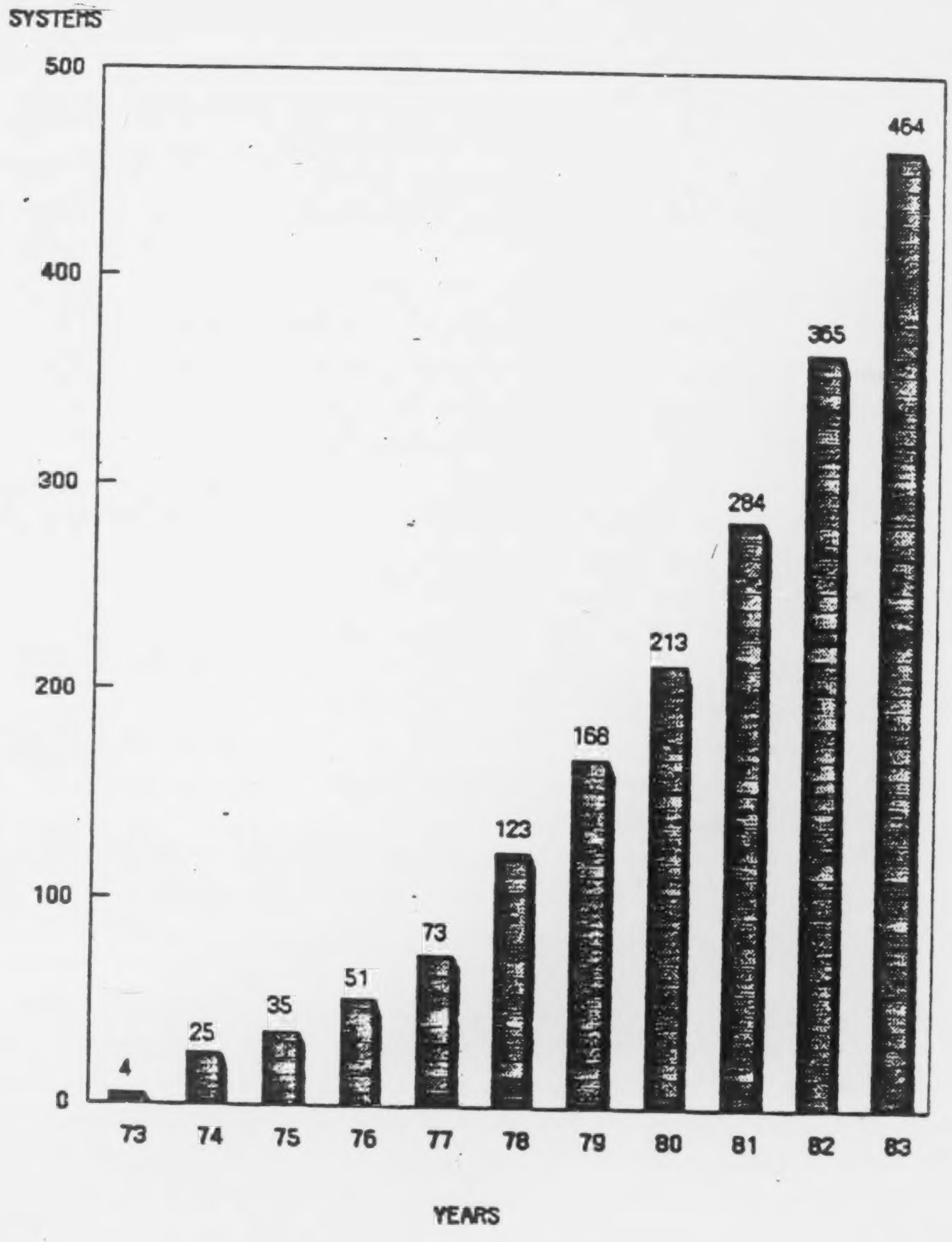

Figure 14: TOTAL NUMBER OF INSTALLED AUTOMATED LIBRARY SYSTEMS; 1973-1983.

The market share of all systems installed at the end of 1983 is displayed in Figure 15. These statistics represent a total market penetration of 1 percent, or a primary market penetration of 2 percent.

One of the interesting trends in the library software market has been the "peaks and valleys" syndrome experienced by the major system vendors. This is largely caused by cash flow problems. At any one time libraries will review the capabilities and prices of systems available at that time. The vendor offering the best set of capabilities for a reasonable price is then selected. One vendor then usually becomes "popular" for a while. The vendor is then faced with concentrating its efforts on installing systems and maintaining them in the field, and consequently efforts to further develop the system fall behind schedule as personnel resources become strained. The vendor is unable to deliver system upgrades and enhancements as originally promised and/or maintenance services become less responsive and the vendor falls "out of favor." This trend is a continuous one so that the marketplace demonstrates cycles of activity over time. This problem for vendors, who generally run fairly small operations, could be overcome by a steady injection of funds for development and/or maintenance personnel.

A second trend we have observed is the increased availability of automated library systems which have been developed by libraries and are now being marketed to other libraries.

A third trend is the increased availability of microcomputer based software packages for libraries. There are numerous directories and inventories of such packages which support acquisitions, catalog card production, online catalog, circulation, serials control, reference, film booking, circulation system backup and other miscellaneous functions.

Finally, the most obvious trend is the rapid growth in the adoption of automated systems and services by libraries. The growth curves show no indication of a deceleration of this growth. There are several reasons why

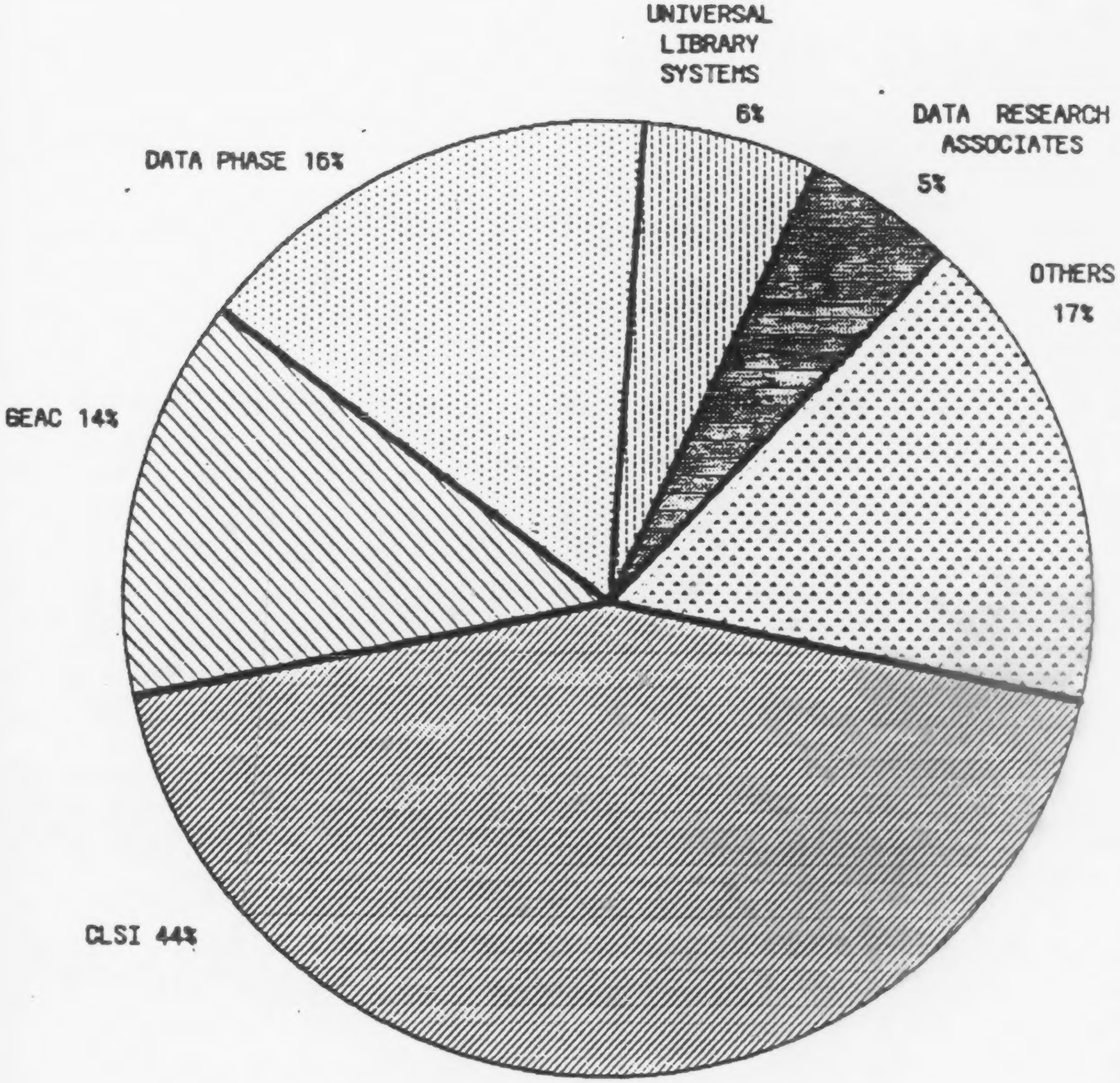

Figure 15: MARKET SHARE OF AUTOMATED LIBRARY SYSTEMS IN 1983.

we can expect continuation of the trends for the short to medium term future at least. Reasons include:

- the continued reduction of prices for automated systems and services which make automation feasible for the smaller libraries (although this trend towards reduced absolute prices is likely to slow significantly from this point forward; instead we will see increased power and capabilities for stable prices)
- the increase in library networking and resource sharing which enables libraries to group together to share systems and services
- the availability of increased LSCA Title III funding to support multitype library cooperation projects - the appropriation increased from $15 million in FY 1984 to almost $18 million for FY 1985
- increased awareness of automated information systems and services on the part of library users
- increased intensity of information use on the part of library users and, consequently, on increasing needs to support more information requests with already strained budgets (particularly personnel budgets).

The use of automated systems and services by libraries raises a number of issues of importance to both the users and library personnel.

- The use of new technology and equipment to provide access to information requires acquisition and funding for the equipment. To fund such acquisition many libraries charge for certain services utilizing new technology particularly if for some reason, they are not considered part of the library's "basic service offering." Particularly common examples include online database searching and electronic document delivery from a vendor.

- The concern about funding services which are supported by new technologies has been the cause of a holding back from offering the services on the part of many libraries. An unwillingness to charge for services by many public libraries for example, and a lack of understanding of how to determine charges, has led to a reluctance to provide online database searching services.

- The use of online database increases the need for primary information identified through searching. Many libraries are concerned about providing any new service that has the potential to increase demand while resources are stretched almost to the limit.

- The trend towards online public access catalogs create the need for education and training of library users in the use of the new forms of catalog. As mentioned in relation to other user education and training, this needs to be provided on an ongoing basis although the availability of computer-aided instruction can alleviate the need.

- A major issue to be addressed by libraries as they become increasingly dependent on the new technologies is the need for contingency plans. It is relatively straightforward, albeit tedious, to maintain circulation transactions when an automated circulation system breaks down; but if the automated system supporting an online catalog fails, users are left with no access to library collections unless a backup is readily available. Fortunately, libraries are beginning to consider various forms of backup such as microform catalogs or compact disk catalogs. However, since backups are generally only used occasionally, the education and training issue becomes important again.

- There is a need for library personnel to receive education and training in the use of automated systems and services and to keep their knowledge and skills up to date.

Libraries providing access to information on a proprietary or classified nature find themselves in a position of having to restrict access rather than promote it, thereby, lowering the value derived from the proprietary or classified information. These restrictions affect both internal personnel and external organizations/users. Access to proprietary/classified information is often restricted at the secondary information level also, particularly if it is automated. This need to restrict access often discourages such libraries from participating in cooperative activities with other libraries. Thus, even non-proprietary/non-classified materials are often not available outside the holding organization.

Fortunately many proprietary libraries to serve "outside" users through informal and reciprocal arrangements. Usually materials must be used with the library, or they are loaned through standard interlibrary loan arrangements.

Since the early 1960's libraries have engaged in cooperative activities and resource sharing. At the present time there are over 1,500 library cooperatives and networks in the U.S. providing a variety of services and products to their members. These cooperatives and networks can be divided into two basic types: those that support one type of library; and those that support multiple types. Both types have proliferated over the years, but in recent times there has been an increase in the number of multi-type library networks as a result of increased funding through LSCA Title III. (In FY 1984 the appropriation for LSCA Title III was $15 million, in FY 1985 it was $18 million of which 2% is set aside for Title IV).

Networks can yeild considerable savings to individual libraries while simultaneously providing access to other libraries' collections. Networking is the means by which libraries have been able to keep up levels of service despite the need to provide access to ever-increasing volumes of recorded information and increasing demands of users without concomitant increases in funding.

The fact that libraries cna provide access to more information at lower cost results in an overall cost savings to society when libraries participate in networks. However, cost savings alone are sufficient to justify participation. The pefomance of cooperative services must also be considered. Recently, library cooperatives and networks have faced increasing competition from prviate sector organizations offering similar services for a fee. These services offer improved performance. For example, the average time taken to receive an item requested through interlibrary loan via a network is over 2 weeks; commercial document delivery services can offer a 24 hour turnaround, for a price. The decision as to which mechanism to use is dependent upon the particular requirements of the user and the perceived value of rapid delivery versus price of the service.

Cooperatives and networks have provided libraries with the means for survival in times of economic restraint. They will continue to evolve, and over time, will form linkages among each other so that library services to users can be optimized.

There are a number of reasons why people choose to use libraries rather than purchase the information or borrow from other sources, such as a friend, colleage, clearinghouse, etc. The main reason is because individuals cannot usually afford to purchase all the information they might want to acquire. Therefore, one tends to purchase those items which will be used frequently, those that are low in price, and those that are not available (at the time wanted or needed) in a library. The library is used for less frequently needed items, older items, and so on.

In a study recently completed by King Research [3] the contributions that librries and library services make to the value of information was estimated. The libraries studied were scientific and technical and the value was determined from what library users are actually willing to pay in terms of the time and effort they expend in using the library and in reading materials identified and obtained through that use. The contribution to the value of the informatin found by using the libraryu made by the library was determined by considering what would happen if the library or anyone of its services were no longer available. Then, assuming the current expenditures (in terms of user time and effort to use the library), the resulting loss of reading is calculated and the value of those lost readings estimated.

The results of this process considering only the value of the libraries in terms of user time and effort expended is displayed in Table 1. The value of the libraries in terms of savings estimated by users in terms of their own time and equipment is displayed in Table 2. Clearly, the saving value is a "soft" estimate but probably is of the right order of magnitude.

Table 1

Total Library Value Found by Substitution for Library Services in Terms of Willingness to Pay by Method of Identification: Rocky Flats Technical Library, Rockwell Energy Systems Group Library and ORNL Library System - 1984

($ millions)

Method of Identification	Journal Articles	Technical Reports
Browsing	$0.787	—
Colleague	0.119	$0.191
Citation	0.327	0.216
Printed Index	0.248	0.126
Online Search	0.116	0.124
Routing	0.132	0.188
Library Acc. List	—	0.322
Other	—	0.048
Total	$1.729 million	$1.384 million

SOURCE: King Research, Inc.

Table 2

Total Library Value Found by Substitution for Library Services in Terms of Savings: Rocky Flats Technical Library, Rockwell Energy Systems Group Library and ORNL Library System - 1984

($ millions)

Method of Identification	Journal Articles	Technical Reports
Browsing	$ 8.3	—
Colleague	1.2	$ 1.3
Citation	3.4	2.7
Printed Index	2.6	0.8
Online Search	1.3	0.9
Routing	1.3	1.3
Library Accession List	—	2.2
Other	—	0.3
Total	$18.2 million	$ 9.5 million

SOURCE: King Research, Inc.

Clearly, the savings value is a "soft" estimate, but probably is in the right order of magnitude. Even so, the extent of number of readings from library materials, time spent by energy professionals in reading these materials and the value determined by what they are willing to pay suggests that library materials and services are extremely valuable.

SECTION 7

OTHER PRIMARY INFORMATION SERVICES

Libraries and publishers, together with bookstores, have been the traditional sources of primary information materials. With the proliferation of recorded information since World War II, a number of other organizations have evolved to support access to primary information products.

7.1 Document Delivery Services

Document delivery services are services that actually deliver documents to users. There are many different ways that users can acquire documents. They can purchase them directly from a publisher, bookstore, document delivery broker, borrow from one's own library or from another library through interlibrary loan. The considerations underlying which of these alternative sources to use lies in the potential frequency of use of the item, costs to use the services, the information requirements (in terms of speed of delivery, quality, etc.) and the perceived value to the user.

Document delivery services have grown hand-in-hand with the growth in online database searching which provided access to numerous citations to publications. Document delivery services act as intermediaries between searchers (who may themselves be intermediaries, or end users) and body of literature. Document delivery services use libraries and clearinghouses as sources for doucments, and recently have begun to develop and maintain their own collections of documents. The availability of an in-house collection of documents offers significant service advantages including one-stop shopping. Only one source needs to be searched to locate a particular document, thus, overall delivery time is reduced. Delivery can be via mail, express mail or courier with associated price levels. Recently, two document delivery services — ISI's The Genuine Article and UMI's Article Clearinghouse began to offer facsimile transmission of documents. Turnaround time can be as short as two hours, again for a price. Document ordering can be by mail (although this method is now discouraged), telephone and recently, online through the database search services.

The demand for single articles or technical reports through document delivery services is increasing. This demand is likely to continue to increase for some time although they may never totally replace traditional interlibrary loan services. Nevertheless, information users will decide which form of delivery service to use according to the specific information needs and requirements related to each information use. In instances where speed of delivery is important, users are willing to pay for the faster delivery service.

An interesting development in the delivery of documents through interlibrary loan and commercial document delivery services has been the changing costs of using these services. For many interlibrary loans seems preferable as there is often no charge to the borrowing library or to the user. However, in a recent study of interlibrary loan costs [ ] it was found that the costs of interlibrary loan range from $11.18 to $13.09 depending on the type of item loaned. Comparing the costs of interlibrary loan with the costs of purchasing the items yielded the results are displayed below.

Type of Material	Cost of Purchasing	Cost of Borrowing	Cost of Lending	Savings through ILL
Monograph	$28.25	$5.70	$6.52	$16.03
Serial (Article)	$10.50	$4.25	$6.93	-$0.68
Other	$56.50	$6.22	$6.87	$43.41

These results indicate that for journal article delivery it can be less expensive to purchase than to borrow from another library. As discounts for bulk purchasing arrangements increase, and as memberships in library cooperatives and library networks increase the price per article will drop and the break-even point will fall making the commercial sevices not only competitive from a cost standpoint but also from the speed of delivery perspective.

As a result, there are considerable incentives to the document delivery services to offer low cost, good quality reproduction, and rapid turnaround to those in need of documents. The fact that royalties are included in the basic charge to users makes the services very attractive to libraries.

7.2 Bookstores, Wholesalers, etc.

Bookstores have always been a source of printed publications for those readers willing to pay for them. Typically, the more frequently an item is read, or likely to be read, the more likely the reader is to purchase items. As publishers move from hardbound books to the large scale production of paperbacks the price per book has fallen and more individuals will purchase them. This has led to recent competition between public libraries and bookstores (and other stores that sell books along with other items), and the controversy over whether libraries should stock the popular "trash" literature as a way of bringing people into the library. This idea has been further extended by having a bookstore within the library.

The most recent entrant into the provision of primary information is the video outlet and the subscription "video library." These concentrate their efforts on video cassettes and the equipment to play them back. Libraries also provide videocassette collections for loan (an area of library collections that is expanding rapidly.

One major problem with these primary information providers is that they tend to cater to popular demand and do not stock the more peripheral, infrequently used items. The provision of these types of items is an area for the public library so that both types of organizations can complement each other rather than compete head on.

7.3 Information Analysis Centers

Information analysis centers are similar to clearinghouses but they provide more customized services in the area of information analysis. The increasing sophistication and awareness of information users is leading to a greater demand for analytical services, as is the increase in volumes of information available. Not only are these specialized information services evolving but libraries, information centers and clearinghouses are beginning to take on the role of analysis centers.

Professionals who perform the analyses must have an appropriate level of relevant subject background to perform the analyses. Furthermore, these professionals must be able to evaluate information sources to give the users of the analyses an indication of the quality of the information on which the analyses are based. This represents a fundamental shift away from the traditional role of the information intermediary as passive gate-keeper to the literature, to a more informed selective, judgemental role.

The growth in the availability of these analytical services results from the end user's lack of time to devote to information-related activities. Such a lack of time becomes more critical as more information becomes available and as the users become more aware of information resources. Many users are willing to pay for customized services.

An interesting intellectual property issue arises as a result of the analysis process in that new intellectual property is created. Who owns the rights to the analytical reports: the analyst, the purchaser (either the user who is charged, or the organization employing the analyst). To what extent do the authors of the information being analyzed share ownership? With the proliferation of such services in the future these questions must be addressed soon.

SECTION 8

SECONDARY INFORMATION SERVICES

Secondary information is information about primary information that is used to identify and gain access to primary information. It has two primary purposes: to organize and control stored primary information (catalog entries) and to search for primary information (abstracts and indexes). It has also been used to provide descriptive information about primary data such as numeric values (faceted classification of numeric values). The generic functions performed on primary information are also performed on secondary information as well and for very much the same reasons (i.e., to improve accuracy, precision, availability, access, etc.). A portion of the activities performed in description and synthesis of primary information are creation and composition of secondary information. Logical access corresponds to use of secondary information. The remainder of the format and structure oriented functions (transformation and evaluation and analysis) apply as well. All of the functions involving content in medium (i.e., recording and reproduction, physical transformation, storage and physical access) are performed on secondary information and exactly the same medium are used as primary information, except the electronic medium is probably used more for secondary than primary information because the amount of information content is less and, therefore, costs are comparably less than competing media. Finally, there is tertiary information, which is information about secondary information that is used to identify and gain access to secondary information.

The growth in number of secondary publications has paralleled the number of scientific publications since about 1840, but at a factor of 300 less (e.g., there are about 300 times as many scientific journals as there are abstract journals). There are also about a dozen tertiary publications and databases that are "directories of directories" or "databases on databases". The first of these started in about the early 1970s. The growth of electronic bibliographic databases had been somewhat greater than either that of the published primary literature or the printed secondary publications [see Williams]. The secondary information publishers, often referred to as database producers, face the same economic dilemma primary producers face in that the cost of producing a bibliographic database is very expensive (order of magnitude of $30 to $60 per item indexed and cataloged). Thus, a bibliographic database of 100,000 items might cost about $3 to $6 million in a year which is a substantial capital investment. There are basically three types of products derived from the original database: printed publications of abstracts and indexes, searches of electronic stores, and electronically stored information (tapes) that is purchased and searched.

Secondary publishers must rely on input of materials from primary publishers. Usually primary publishers automatically send copies of preprints of articles or a journal issue to the secondary publishers in order to make the secondary publications as current as possible. Announcements in the secondary publications are thought by primary publishers to be a form of promotion or advertising. However, some journal publishers now charge secondary publishers for their materials and there has recently been some friction between primary and secondary publishers because some secondary publishers are using the database of accumulated journal articles as a source for sale of single article copies. Journal publishers see this as a threat to their subscription sales, without corresponding increase in revenue. Journal articles appear in an average of about six abstracting and indexing (A&I) publications, although science and technology is somewhat higher on the average.

Another source of recent friction between primary and secondary publishers involves the fact that the primary publishers create (usually by the author), record, reproduce and distribute the contents of secondary information. Secondary publishers also perform these functions, often partially derived from the author-composed abstract and indexes. Primary publishers are beginning to say they own the secondary intellectual property and, therefore, secondary publishers are violating this ownership by publishing their own astracts and indexes. Although differences are being addressed, the further distribution of single copies of articles is likely to exacerbate the problem. One solution is for secondary publishers to pay adequate royalties to primary publishers for sale of single article copies.

Secondary publishers have a very sensitive economic situation in which their derivative products compete against one another. Users (mostly libraries and other intermediaries) have a choice of manually searching printed publications, searching bibliographic databases through vendors, or purchasing electronic digital tapes and searching these tapes in-house. The general economic trade-off is that manual searching costs less up to a certain number of searches (about 150 to 200), at which point online searching costs less up to a number of searches (about 6,000), in which case it becomes less expensive to search in-house. Many people in the 1970s predicted that online searching would replace manual searching from printed publications so that secondary publishers began to price and market for that eventuality. However, those who made the prediction failed to recognize that the economic trade-off favored both manual searches and online searches depending on the type or degree of difficulty of the search. In fact, it is generally less costly to search quick look-up searches manually and in-depth searches online. Since most libraries have many searches of both kinds, they have found it most economic to purchase both printed publications and online searches, thus accounting for the lack of large-scale migration from printed publications to online searching.

For some secondary publishers, the printed publications are quite expensive (having established prices prior to availability of searches of electronic medium), ranging from $500 to $5,000. An exception to this are bibliographic publications produced from government funding. Revenue from online searching has been generated from royalties derived from online searches of vendor databases. These royalities initially were based on an hourly rate for connect time which ranges from about $60 to $150 per connect hour. The royalty usually was about ten percent of the rates above. Then secondary publishers also began to charge for the number of items identified and/or printed out. Typical royalties for "hits" are $0.05 to $0.50 per hit. Some secondary publishers have decided to complement or replace vendor services by providing searches directly to users. This practice has the advantage of higher potential revenue. However, it means that shared marketing from vendors and the ability of users to easily switch from one database to another is lost. Typical charges for electronic digital tapes are $10,000 to $20,000 for an annual input.

The pricing dilemma of secondary publishers is that, if they price one product (e.g., printed publications) too low, the sales for that product will go up (producing some increase in revenue) but the sale for the other (e.g., online) will go down (resulting in some loss in revenue). If the loss in revenue is greater than the increase, the secondary publisher will lose income and, if enough, could go bankrupt. Generally, our studies show that price elasticity of printed publications is more sensitive than online royalties. Thus, it is generally better to "tinker" with royalities (up to a point) than with the printed publications. The reason for this is that the royalties are a fairly small add-on to the vendor prices. For example, if a royalty on connect time is $10 on a $100 charge (for $110 charge to the user), doubling the royalty merely varies the charge to to the user by nine percent. Since a nine percent increase in the user charge probably would not affect number of searches much, the revenue to the secondary publisher would nearly double. This is a phenomenon that many secondary publishers were slow to recognize. We believe, from our data, that most large secondary publishers currently derive more income from online royalties than from printed publications or sale of electronic digital tapes which generally provide margingal income.

The two most important questions at this point are (1) whether intermediaries will continue to be used or if they will be replaced by end-user searches and (2) whether large libraries and information centers will begin to do all their searching in-house from purchased tapes or databases or down-loaded from bibliographic vendors. We believe that it is unliklely that end-users will do most of their searches (approximately 90% of the scientific and technical searches are now done by intermediaries). The reason for this is that the time of end-users is a very scarce resource and it is less expensive to delegate searching to an intermediary. Furthermore, searches can usually be done faster and with greater quality by someone who frequently conducts searches as opposed to users who average fewer than three searches per year (again in science and technology).

The principal constraint in doing in-house searching is the expense of transforming purchased tapes to store on a large in-house computer and in developing software for conducting the searches. Downloading avoids the transformation expense but not the storage and search software expense.

Even so, some large libraries have found it less expensive to search in-house. Perhaps more of this alternative would be employed if the current envimonment were not so negative about ongoing information services, let alone a large one-time investment that would be required. In the long-run, we believe more down-loading and in-house searching is inevitable. This presents a problem in revenue to both the secondary publishers (who will lose royalty income) and vendors (who will also lose a source of income). We believe the best solution to the problem is to license downloaded material (or charge a royalty) with a charge, for income to secondary publishers (roughly in proportion to number of likely searches to be performed or counted) and for income to vendors to clearly cover large front-end costs plus some profit.

One of the most phenomenal activities of bibliographic services has been creation and processing of catalog information by Library of Congress that as been used by libraries throughout the world. As part of its responsibility in registerting, recording and storing copyrighted materials, the Library of Congress must organize and control over 500 miles of shelves of these materials. The catalog records are provided to the library community through a number of media including electronic digital tapes, printed publications, microform publications, and catalog cards. The electronic digital tapes are purchased by bibliographic utilities, some book publishers and brokers, and large libraries. Libraries use the original catalog information to avoid having to originally catalog these items, but they do add some local secondary information to the records. The availability of the catalog information has saved hundred of millions of original cataloging each year. For example, in a recent survey of Cataloging Distribution Service customers, it was found that nearly 90 percent of the original catalog records were available, thus saving these 3,063 libraries about $200 million each year. Furthermore, the catalog database created by LC serves as the nucleus for integrated library automation systems which are used for many library functions such as acquisition, circulation, searching, interlibrary lending and so on, thus achieving further potential savings.

A very important issue had arisen concerning ownership of the created catalog records. Are they owned by the Library of Congress who did the original cataloging, the bibliographic utilities who store and provide access to the records, or the libraries who input some original catalog records (when original catalog records are not yet in the system)? The Library of Congress has not claimed ownership because the original cataloging was largely done for other purposes and under government funding. Yet, since the government distribution services are required to recover costs (under OMB Circular A25), it may be necessary to charge royalties or derive some additional revenues through sale of electronic digital tapes. Currently the tapes are sold at cost of reproduction and distribution. There is also a concern of deriving adequate revenue from sale of these products to non-U.S. organizations. The bibliographic utilities maintain that they incur substantial cost of adding-value (by the services they provide) and must protect this investment by claiming intellectual property ownership. Thus, they now require royalties for downloading the database which is used for many purposes including integrated library automation systems. Some library cooperative users of the bibliographic utilities have claimed they own at least part of the bibliographic database because they input many of the created catalog information.

Another example of secondary information is explicit knowledge bases. For example, such a system is the viral hepatitis "knowledge base" developed at the Lister Hill Center of the National Library of Medicine. That system provided that several experts contribute an update to several hundred issue areas on a periodic basis. These issue areas involved specific answers to questions that might be collectively frequently asked by medical practitioners, clinicians, students and researchers. The system is feasible, despite a large knowledge base creation and recording cost because of need for frequent update (i.e., it is in a very active research field) and the disease area is frequently encountered by practitioners. If the reasearch field was not so active, a printed publication would be less expensive and currenty could not be a problem. However, since frequency of use is high and currency very important, such a system has a great deal of potential in certain medical (and similar) fields. The electronic knowledge base can also be compelmented by a printed publication when a particular part of the field becomes stable. Several such systems are being researched.

Such electronic systems for creating and composing information may result in questions of ownership. A recent example has been original cataloging input by libraries to bibliographic utiltities. Libraries have grouped together to argue that they, not the bibliographic utiltities, own the intellectual property so that the bibliographic utilities cannot dictate or make policy concerning royalty payments, constraints on downloading and so on. As more multiple authors contribute to explicit knowledge bases, the same questions of ownership are likely to arise. Another very important issue that is likely to arise because of this new technology, is accuracy and precision of input, particularly of content and structure. There are those who argue that informal distribution through the electronic processes reduces the need for formal review or refereeing. Furthermore, some predict that less of the information that is now published will actually be formally published because of the potential for direct electronic distribution among peers. At least information distributed in this way might be accepted and used before formal referencing takes place. It would seem this is likely to happen only if there is some formal acknowledgement or recognition for information distributed in this manner. Such formal acknowledgement and recognition also helps ensure that quality of contributions by multiple creators and composers, since poor quality would be attributable to an individual.

All of these conflicts above are not trivial and must be resolved or the vast savings achieved through cooperative efforts may be lost in the future. It must be recognized by all involved that each participant must be adequately compensated for their value-added services. This compensation must be for costs incurred as well as for capital investments and risks taken. The greater the risks the more compensation must be to ensure that service will continue to be provided; otherwise the service cannot be provided. If the amount of compensation is too high for users, then the service should change or go out of existence. Again, we believe that the issue is not so much one of protection of the information content as it is one of ensuring that participants are adequately compensated for their value-added services. This can be accomplished by means other than copyright. Laws that make licensing clear and easily implemented would be a step in this direction.

SECTION 9

PRIMARY INFORMATION USERS

Earlier, we discussed the major types of information needs and user requirements for information. In this section, we focus on the alternative information sources available to users and tradeoffs of selecting one or more of them.

Information needs can be divided into those relating to:

- personal needs
- lifelong learning
- organization and professions
- governing society
- international cooperation.

User requirements for information include:

- accuracy
- precision
- currency
- accessibility
- timeliness
- cost.

In a recently completed study [13], the information needs of the general population of Orange County, California were identified. The information needs identified varied according to age group. The most frequently needed information for both 14-18 year olds and 19-24 year olds is education-related (needs by 45% and 36%, respectively), followed by current events and news (25% and 21%, respectively).

In the 24 to 54 age group, the most frequently needed type of information is current events and news (39%) followed by education (34%) and recreation (30%). In the 55 to 64 age group, current events and news information is needed even more (53%), followed by consumer information (34%) and health-related information (28%). In the over 65's, health-related information needs dominate (40%) with current events and news (28%) and recreation and money matters following closely (23% each). Thus, information needs change through one's lifetime, with education dominating the needs early on; current events and news, recreation and consumer-related information replacing educational needs in mid-life, and health matters dominating later life. As the general population includes more and more of the elderly, information services need to develop their capability to support their information needs.

In reveiwing the sources of information used to fulfill the various needs that arose, the newspaper was used most frequently (in 22% of the instances). This was followed closely by the library (18%). Books were consulted 11 percent of the time, radio and TV six percent, magazines five percent, friends four percent, and community information centers three percent. Other sources included doctors, lawyers, and other specialists.

Users of information are being increasingly exposed to the new information technologies - microcomputers, online database searching, videocassette recorders, etc. There has been a great deal of discussion of how, as the user becomes more "computer and information literate", the information professional will no longer have a role to play as intermediary. In fact, the opposite is found to be true. Admittedly, end users of information do tend to perform some of their own information searches particularly when they have become comfortable with available systems. However, as they do more searching they recognize that more of their time is being taken up with information searching and retrieval activities. They learn that there are numerous sources of information to choose from, and that the sources change over time in terms of coverage, procedures for use, etc.

Once they recognize the complexity of information searching and retrieval, they begin to return to the information professional as an intermediary. However, their experience has given them a better awareness and understanding of information systems; they are more able to communicate their needs; and they are more sophisticated in terms of demands and expectations.

The end users determine whether to search for information themselves or to have an information professional do so on their behalfs according to their needs and requirements, and in terms of their own time. Thus, for simple look-up type searches, the users tend to do their own searching; for more complex searches, the intermediary is usually asked. Such behavior has been observed in large organizations where all professionals and almost all non-professionals have access to a microcomputer or terminal at work or at home. The end result after a period of learning is that more information searches of databases are performed, and more information is used.

Users "pay" for information not only in terms of monies exchanged but also in terms of the time and effort they expend in acquiring and using it. Thus, in selecting among alternative sources of information for each unique combination of needs and requirements, the user has to consider the value of his own time in using the various alternative. Generally, the user will select the most labor saving approach for a certain level of quality, timeliness, dollar price, etc.

An example of the effects of such decisions on information service provision involves the relationship between the distance (in terms of travel time) to a library and the average number of visits made to the library as shown in Figure 16. Once a user has to travel over 10 minutes to the library the number of visits drops significantly.

Another interesting statistic that occurs repeatedly is the proportion of time professionals spend on acquiring and readig information. Naturally, there are variations from field to field but, on the whole, professionals seem willing to spend up to 20 percent of their time engaged in information related activities.

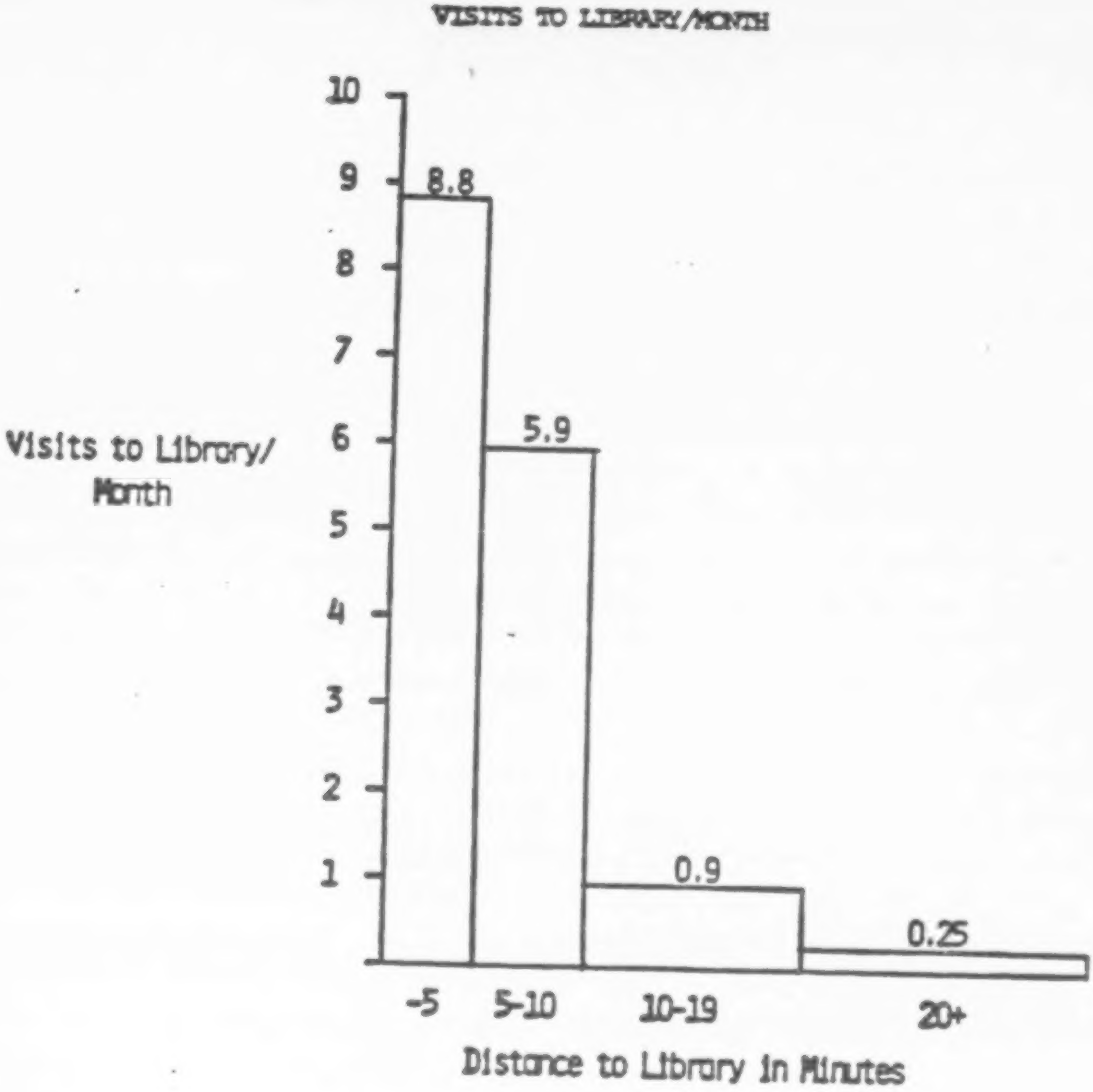

Figure 16. Number of Visits to the Library Per Month as a Function of Distance to the Library in Minutes

One of the issues regarding user access to and use of information results from the large scale adaption of new technologies. A new rift is being created between those who can and are willing to use the new technologies and those who can't or won't. Even though vendors talk of user-friendly devices most require intricate maneuvering. Thus, user education and training is becoming an increasingly important issue.

A related issue is that information captured in non-print form is not accessible directly — it requires some form of equipment to make the information accessible to the user. The user is then equipment bound and cannot access the information except where the necessary equipment resides. There is much discussion of portability of devices, but the portable microfiche reader was never a great success. However, it is a fairly safe assumption that, in spite of all the predictions about the electronic library, electronic office, etc., paperform will continue to be used, at least of end-use if not for storage or transmission.

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Seitz

EFFECT OF STANDARDS ON INFORMATION TECHNOLOGY R & D

Local Area Networks and Integrated Services Digital Networks

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INTRODUCTION

This report is in support of the OTA project on Information Technology R&D. The report addresses the question raised by OTA: What impacts do standards and the standard-setting process have on information technology R&D? To illustrate the answers to this question, OTA identified two case studies for investigation: local area networks (LAN) in the computer area and integrated services digital networks (ISDN) in the telecommunications area.

At first glance, the question posed by OTA strikes some as rather curious. R&D must obviously precede the development of standards. How then can standards affect R&D? Moreover, the very concepts of standardization and innovation appear incompatible. Thus the rationale for pursuing the effects of standards on information technology R&D may not be immediately obvious.

However, both LANs and ISDNs are system technologies. And the component parts of these systems will generally be supplied by a variety of vendors. Standards are essential, therefore, to ensure compatibility between the components so the system as a whole can function properly. These two technologies are also actively developing technologies. Thus the impact of standards and the standard-setting process on R&D and the continuing development of these technologies is a very pertinent question: How is the balance struck between standardization to ensure compatibility, on the one hand, and the allowance of ample latitude for continuing innovation, on the other hand. In each case, both domestic and foreign standard-setting organizations are involved in developing voluntary consensus standards. These two cases provide interesting examples of the subtle interactions between the development of voluntary consensus standards and the ongoing process of technological innovation.

Competition provides the principal impetus for advances in an industry's technology. The development of voluntary consensus standards, however, entails cooperation between marketplace competitors. The technology of every industry is composed of both proprietary and nonproprietary elements. Standards are an important part of the nonproprietary portion. Other nonproprietary elements include the general scientific and engineering principles that underlie an industry's technology (generic technology), basic data characterizing materials, and test and measurement methods. Since this type of technical information does not give a competitive advantage to particular firms, competitors can collaborate in its development, as they do in the case of standards. While competition provides an adequate driving force for advancing the proprietary elements of an industry's technology, this may not be the case for the nonproprietary elements. Yet advances in proprietary products and production processes draw on the nonproprietary pool of information. Thus there may be a role for the government to support research in advancing the nonproprietary elements of an industry's technology.

It is helpful to view the impact of standards on R&D as part of the dynamic interactions between the proprietary and nonproprietary elements of an industry's technology. This perspective is especially useful in considering policy implications.

An interesting difference between the case studies examined in this report is the government role in developing standards in the two cases. In the case of LANs, the National Bureau of Standards (NBS) is playing two distinct but closely related roles: 1) developing procurement standards for the federal government so the government can be a "smart buyer" of LANs, and 2) actively advancing the nonproprietary elements of LAN technology, including, but by no means limited to, participating in developing voluntary consensus standards. Both of these mutually complementary roles require a high level of technical expertise. In the case of ISDN, the Federal Communications Commission (FCC) plays a regulatory role. The FCC and the National Telecommunications and Information Administration (NTIA) are participating in the standards development process for the purpose of raising the policy issues posed by ISDN. However, these agencies do not bring the same depth of technical resources to the standards development process as does NBS. This report does not attempt to critically assess the government role in either case. However, it is important to recognize the significant difference between the government roles in the two cases. Recognition of this difference is a point of departure for analyzing any policy implications of the impact of standards on information technology R&D.

See Annual Report

Where does NBS' "high level of technical expertise" in LAN work come from? Contracts with BBN? Inside experts?
Can NTIA role rightly be described as purely policy and non-technical?

The approach in this study has been to rely on interviews, primarily telephone interviews, as the basic resource for answering the key question: What is the impact of standards on information technology R&D? Recent articles from the trade press have also provided many useful insights. Some of the recent literature on standards and the relationships between proprietary and nonproprietary elements of an industry's technology have also proven to be very helpful.

The first section of the report briefly sketches out a conceptual overview for analyzing the impacts of standards on industrial innovation. We then present the two case studies.

CONCEPTUAL OVERVIEW

We sketch out in this section a conceptual overview for relating standards to private investments in R&D. The purpose is to place the two case studies in a broader perspective. We begin by considering the various functions of voluntary consensus standards and the ways in which these functions affect private sector innovation. The relationship between standards and private sector innovation is only part of a broader relationship between the proprietary and nonproprietary elements of an industry's technology. Recongition of this broader relationship is especially helpful in considering appropriate government roles. While it is beyond the scope of this report to fully develop this broader relationship, it is pertinent to briefly discuss its significance. We illustrate the various relationships discussed in this section with examples drawn from diverse economic sectors. These examples indicate the generality of these relationships and help to highlight both the similarities and the differences of each of the case studies examined in this report.

Background. Voluntary consensus standards in the United States are developed largely within a marketplace setting. The incentive for firms to participate in their development therefore follows from the functions that standards play in the marketplace: producers try to maximize their profits, and consumers try to get the greatest value from their expenditures. Thus producers and consumers make their decisions individually to initiate or participate in the standards development process based on the benefits they expect from the standards.

A broad diversity of standard-setting organizations provide the forums for developing voluntary consensus standards. These organizations include: independent organizations with a broad-based constituency, such as the American Society for Testing and Materials; professional societies, such as the Institute for Electrical and Electronic Engineers; and trade associations. The American National Standards Institute serves to coordinate the development of standards among these various organizations and to represent U.S. voluntary standards interests in non-governmental international standards organizations. The major ones are the International Standards Organization and the International Electrotechnical Commission.

Because compliance with standards developed in the private sector is completely voluntary, the standards must command a broad consensus to be effective. This basic fact determines the general process for developing and adopting voluntary consensus standards. Standards are developed by technical committees composed of representatives from the various interests which have chosen to participate in developing the standard. The adoption of a standard requires a substantial majority of the technical committee. Substantial majority means greater than a simple majority but less than unanimity. Draft standards are reviewed by persons outside the committee with an interest in the standard. Negative comments in the review process must then be resolved by the committee. Different standard-setting organizations have varying degrees of due process requirements to ensure fair representation on technical committees and an open, thorough airing of issues. The features outlined here, however, are the core of the standard development process.

Functions of Standards. The first step in linking standards with private sector innovation is to define the various functions that voluntary consensus standards play. It is useful to distinguish four different functions.[1]

- information
- quality
- compatibility
- reduction in variety

A single standard might incorporate each of these functions, but the functions themselves are nonoverlapping. It is instructive to briefly discuss each of these functions and the factors that create an economic demand for them.

The information function includes three subfunctions: terminology, measurement methods (e.g., procedures for measuring various properties of materials), and test methods (e.g., procedures for determining product durability). Information is costly. These standards help to produce and disseminate reliable information pertinent to commercial transactions.

Quality standards establish a minimum level which a product, process or service must meet to be acceptable. For the most part, the market itself determines the demand for quality. However, there are some conditions under which the market is unlikely to supply the necessary level of quality, e.g., safety standards.

The compatibility function ensures that two or more related products produced by different manufacturers fit with one another, e.g., screw threads. Clearly, this is the function of greatest interest for any systems technology. Compatibility standards ensure that the joint performance of two or more products achieve a satisfactory level of performance. In this regard, they play a quality function for multi-vendor products coordinated together.

Compatibility standards allow users to purchase from any of a number of producers. Thus one might expect users to have a greater incentive than producers to develop compatibility standards However, innovation produces mixed desires in consumers for compatibility standards. On the one hand, they wish to have the benefits of innovation. On the other hand, they want products they already own to remain compatible with new products.

The existence of integrated producers is also an important factor. Such producers can resolve compatibility problems on their own without the use of standards. Either they tend to lock users into their own line of products, or their products set a de facto standard to which other producers must conform (e.g., IBM compatible equipment in the computer field). Such users are generally unlikely to support the development of compatibility standards.

On the other hand, producers may have to forego profits from potential market growth not realized because of a lack of compatibility standards. If potential market growth is substantial, these profits foregone could well exceed any losses from increased competition. In such cases, both users and producers are likely to favor the development of compatibility standards.

Finally, variety reduction standards perform an obvious function. A key motivation for variety reduction standards is to capture economies of scale. Users, on the other hand, often place a value on differences in variety. Resolving the tension between these two objectives tends to be the issue for variety reduction standards.

Relation of Standards to Innovation. Having discussed the various functions of standards, the next step is to indicate how these functions can affect innovation. There are several interrelated factors that affect a firm's decision to invest in the R&D to develop new products and production processes: the perception of technical opportunity, the action of competitors, corporate strategy, and so forth. These determinants of innovation can be linked to the various functions of standards in a variety of ways. A few examples offer the most direct way of illustrating the diverse ways in which standards can affect innovation.

A recent study supported by the National Bureau of Standards analyzes the influence of standards on innovation in the semiconductor manufacturing and materials industry.[2] At first glance, the differences between the impact of standards on the semiconductor industry and the two cases studied in this report are more striking than the similarities. Thus it may appear to be something of a digression to consider these examples. However, it is instructive to see that there are some basic similarities despite very significant differences. And the following examples provide a useful point of departure by helping to highlight those features of standardization in LANs and ISDNs that are most distinctive.

The NBS study distinguishes three periods in the evolution of the semiconductor industry.

- Emerging period (1947-1961). Many different devices and processing techniques were developed, but no single product or process was widely accepted.
- Transition period (1961-1971). Certain products became accepted, such as the integrated circuit. One processing technique became widely accepted. Demand skyrocketed.

- Maturing period (1971-present). The microprocessor emerged, and there is a continuing push for smaller, denser devices. Emphasis is on cost and quality control in production, underlined by foreign competition.

Standards have become important only in the last period. Greater emphasis on cost and quality control created a push for automated production. Correspondingly, the locus of innovation in production technology shifted from semiconductor device manufacturers to equipment manufacturers. In addition to semiconductor device and equipment manufacturers, the manufacturers of silicon wafers constitute a third segment of this industry. Silicon wafers are the starting material for making semiconductor devices. A prerequisite for automating semiconductor device manufacturing was ensuring compatibility between wafers and production equipment. In addition to paving the way for automated production equipment, standards also had other important impacts on innovation.

For example, wafer dimension standards were developed in the early 1970s. Before these standards were developed, many wafers were custom designed to the individual specifications of circuit manufacturers. Some wafer manufacturers were faced with over 2,000 different specifications. These standards established only a few standard wafer sizes, thereby reducing variety. One of the consequences was that wafer manufacturers could capture greater economies of scale, thereby facilitating the introduction of automated wafer production (not to be confused with the automated production of semiconductor devices).

Wafer dimension standards also fulfilled a compatibility function and paved the way for the development of automated production equipment for semiconductor devices. Both semiconductor manufacturers and equipment manufacturers realized that with wafers of standard sizes, equipment could be developed to carry and transfer wafers from one work station to the next in the device fabrication process. Two different functions played by the same standard can therefore have different effects on innovation.

The process of standard setting can also be important for innovation. For example, standards were developed for the plastic and metal wafer carriers used with most automated wafer processing equipment. These wafer carrier standards also play a compatibility function. Interestingly, these standards were developed more or less concurrently with the development of the carriers themselves to facilitate the adoption of automated fabrication equipment. As we will see later, it is not uncommon for products to be designed to draft standard specifications once the standard has become sufficiently defined and reached a broad level of consensus.

The information function of standards is also important for LANs and ISDNs. The standards for measuring and testing physical properties of silicon wafers therefore offer a further pertinent example of the linkages between standards and innovation. A consistent method of testing was deemed desirable to reduce disagreements between wafer manufacturers and semiconductor manufacturers about wafer specifications. Recognition of this need prompted test equipment manufacturers to invest in the R&D necessary to develop better test methods. The development of one of these standards was roughly concurrent with the introduction of the testing technique itself. In fact, discussions during the technical committee meeting were helpful in resolving certain technical issues. We will also see in the case of LANs that the technical committee meetings were useful forums for resolving technical issues. These standard test methods fulfill the quality function as well as the information function by certifying compliance with the wafer dimension standards. These standards specify certain quality criteria as well as dimensional criteria.

Test methods often serve as valuable research tools as well as facilitating commercial transactions. The information in the test method standards gives firms the ability to detect scratches and other defects in wafers at submicron levels. This capability aided device manufacturers in developing advanced lithographic techniques necessary for very large scale integrated (VLSI) devices. It is also worth noting that automated production is an important factor in the fabrication of VLSI devices. Thus standards have indirectly contributed to this product innovation.

These few examples illustrate how the various functions of standards can have diverse impacts on innovation. Obviously, standards have the potential for inhibiting innovation. Yet it is apparent from these examples that standards can also have a positive impact on innovation. To be sure, the innovations considered here were of the incremental variety, not radical innovations. In this regard, it is significant that standards only became important in the maturing phase of the semiconductor industry. This is as one would expect from the product life cycle model of innovation. In this model, when a radical product innovation initially emerges, many of its features are in a state of flux. Gradually, the product becomes more standardized and increasing attention goes to efficient production. In this phase, standards can contribute to the continuing evolution of the technology, as in the semiconductor industry.

The particular role that standards play in each industry depends on the character of the technology and the structure of the industry. In the case of LANs and ISDNs, standards play a critical role much earlier in the evolution of the technology than was the case for semiconductors. This is not surprising since the evolution of a system technology does not conform to the product life cycle model. Moreover, it is a more complex task to establish compatibility between the equipment of different vendors in a computer or telecommunications network than it was between semiconductor production equipment and silicon wafers. In the former case, the design of the network itself must be standardized.

Nonetheless, despite obvious differences, there are basic similarities. Standards help to define markets for complex technologies and facilitate marketplace transactions. Consequently, both users and producers support their development.

Proprietary and Nonproprietary Technologies. Before launching into the two case studies, it is instructive to put the impact of standards on innovation into a broader context. Standards are only one component of a class of technical information which is generally nonproprietary. This class of technical information needs to be carefully distinguished from the class of proprietary information embodied in product and production processes. Taken together, these two classes constitute the technology of an industry.

The first purpose of this section is to point out the complementary relationship between these two classes of information in the evolution of an industry's technology. The second purpose is to point out how this relationship suggests an important role for the government in promoting technical progress, productivity growth and the international competitiveness of U.S. industry. Clearly distinguishing this role is helpful in analyzing the policy implications of the case studies.

Tassey distinguishes between two subclasses of the nonproprietary class: generic technology and what he calls infratechnology.[3] Generic technology is defined as those scientific and engineering principles from which proprietary applications are derived. The generic technology base itself is competitively neutral in that it can be shared by all firms without reducing the potential benefits for any one firm.

Infratechnology includes such things as the basic data characterizing materials, test methods and standards. Infratechnology is the knowledge base necessary to actually implement product and process design concepts. Infratechnologies are also competitively neutral.

Taken together, generic technology and infratechnology provide an essential complement to an industry's proprietary technology, and they are necessary for its continuing evolution. Obviously, numerous linkages could be established between generic technology and infratechnology, on the one hand, and proprietary innovations on the other, just as was done in the preceding section for standards. Thus standards are only one part, albeit an important part, of a larger class of technical information which is distinct from, but essential to, proprietary applications.

The reason for emphasizing this point is two-fold. First, it is important to recognize that generic technology and infratechnology are competitively neutral. That is why this class of technical information is generally nonproprietary. As a consequence, competitors can legitimately collaborate in developing this type of information, as they do in standards development. Where there are gaps in the knowledge base needed for proprietary applications, firms may decide to invest in developing this type of information. However, because it is hard to fully capture the benefits from this type of investment, firms are believed to systematically underinvest in developing this class of information. Consequently, governments of virtually all industrialized countries support research in these areas. In the United States, NBS is the principal locus for this type of research.

The second reason for emphasizing that standards are only one part of a larger class of technical information is that developing this information entails several distinct but closely related functions. For example, NBS frequently performs the following activities to advance and develop the nonproprietary class of information.[4]

- o participates in domestic and international standards development
- o develops new test and measurement methods
- o performs generic R&D
- o precisely characterizes the properties of materials
- o provides a forum for cooperative R&D efforts among industry participants

All of these functions require a rather similar base of technical expertise so that it is important to perceive how these activities mutually complement and reinforce one another.

Another related but distinct function is that of developing technical procurement standards for the federal government. The benefits of this activity accrue directly to the government. The benefits of contributing to the advancement of generic technology and infratechnology are more diffuse. These benefits derive from enhancing productivity growth and international competitiveness. Thus these two functions are clearly distinct.

However, they both fall into the category of nonproprietary information and both require comparable expertise and are therefore mutually complementary. Thus it is useful to group them together.

Whether there is an appropriate role for government and what that role should be depend on the particular situation. A recent study examined a diverse sample of eight NBS projects: ethylene thermodynamic data, optical fibers, initial graphics exchange specification, antenna metrology, robot vision, rapid solidification technology, dental materials, and reduced-size venting.[5] Each of these cases involved a different mix of the above mentioned activities. In each case the government role must be tailored to the particular situation. But the diversity of activities should not obscure the basic function of contributing to the pool of nonproprietary information that supports proprietary applications.

It is important to distinguish research on generic technology and infratechnology from basic research. Basic research is usually defined as research in which the investigator chooses the direction of the research on the basis of its scientific significance. Any applications from this type of research are likely to be long term. The scientific significance of the research is the primary motivation for performing it. Correspondingly, it is widely appreciated that government support for basic research is essential because firms generally support little research that is not aimed at applications.

Research on generic technology and infratechnology, on the other hand, is primarily directed toward applications, not scientific significance. Thus it clearly differs from basic research as just described. Applied research can encounter problems as fundamental and intellectually challenging as basic research. Yet the motivation for the research differs in the two cases.

Unfortunately, the government role in supporting the development of nonproprietary technical information is not so well understood as the role in support of basic research. The latter role seems to be almost universally appreciated. However, because generic technology and infratechnology are so closely related to proprietary applications, it is easy to misperceive these functions as belonging exclusively in the private sector. The essential and dynamic relationship between advances in nonproprietary and proprietary information has received relatively little attention in the literature on technological innovation. Yet it defines an important role for the government. And it is necessary to clearly distinguish this role in order to appreciate some of the differences between the two case studies in this report.

LOCAL AREA NETWORKS

A local area network (LAN) is a system for interconnecting computers, terminals and peripheral data stations within a local environment so they can communicate. A local environment might be a set of office buildings, a college campus, or a manufacturing complex. As offices and factories move toward automation, local networks for sharing information and computer-related resources are proliferating.

The design of networks, or the network architecture, raises a basic question. Will network architectures be proprietary or in the public domain? If proprietary, then networks will be limited to linking together the equipment of a single vendor. If network architectures are placed in the public domain through standardization, then users can link together equipment from several different vendors. Standardization efforts have made significant progress to date, and these standards are already being implemented in new product offerings. This study describes current standardization activities and their impact on the development of networking technology.

Network Architecture. LANs tie together information processing equipment so that each device in the network can receive and transmit data from every other device. There is no master switch in a LAN to link communicating devices. Access of each device to the transmission medium, which is a coaxial cable or similar link, is autonomous. Distances covered by a local network range from approximately 0.1 to 10 km.[6]

Beyond these generic features, there are many alternative design concepts for constructing local networks. In order to discuss current standardization activities, it is necessary to have some framework for discussing network architectures. A useful frame of reference for discussing network architecture is the Open Systems Interconnection (OSI) model of the

APPLICATION LAYER (layer 7)

Layer 7 is the source of data, usually consisting of services which process data (i.e. data are combined, converted, calculated and processed to create new data). Airline reservations and on-line banking are just two examples of possible user applications.

PRESENTATION LAYER (layer 6)

Layer 6 provides data formats and data information, if needed. Examples of presentation layer services are data translation, data encoding/decoding, and command translation for virtual terminals.

SESSION LAYER (layer 5)

Layer 5 establishes, maintains, and terminates logical connections for the transfer of data between processes. Examples of session layer services are: dialogue control, message unit flow control, and segmentation of message data units.

TRANSPORT LAYER (layer 4)

Layer 4 provides end-to-end control signals from user terminal to user terminal across the network (e.g. network acknowledgment or received information).

NETWORK LAYER (layer 3)

Layer 3 provides the control needed for call establishment and clearing through the switching network nodes.

DATA LINK LAYER (layer 2)

Layer 2 protocols provide reliable transmission over a single data link including frame management, link flow control, and the link initiation/release procedures.

PHYSICAL LAYER (layer 1)

Layer 1 provides the mechanical, electrical, functional, and procedural characteristics needed to establish, maintain, and release physical connections between the network termination and the exchange.

Figure 1. Seven layer Open Systems Interconnection model of the International Standards Organization. (Source: Federal Communications Commission's notice of inquiry on ISDN, adopted August 4, 1983).

→ and reference to CCITT ?

International Standards Organization (ISO).7/ This model was developed to fill the need for a basic framework within which specific standard protocols could develop. That is, the model sets forth a general framework and the principles by which a network system is supposed to operate. But specific standards are necessary to fill in the many details necessary to implement a network design.

this gives the impression that ISO Model focuses on networks -- it does not, but focuses on systems connected to networks -- only our recent work on IONL and our proposed work at SDN actually addresses networks themselves

A basic concept of the OSI model is that of layered protocols. Linking computers together by in a network creates the opportunity to distribute functions that formerly existed within a single computer. A prerequisite for network-wide applications is a preestablished agreement on how the various machines are to communicate with one another. The OSI model separates the communications task from the network-wide applications. It then divides the communications task into seven subtasks or layers, as shown in Fig. 1. The layers support one another in hierarchical fashion--e.g., layer 2 is served by layer 1 and, in turn, serves layer 3. Layers also communicate with equivalent layers in other devices by protocols or prior agreements on how a particular task is to be carried out. For devices from different manufacturers to be compatible, standard protocols must be established for each layer.

All the network architectures currently proposed by various standards organizations or offered by commerical vendors are based on the layered design approach. The layered approach is especially advantageous because the layers are relatively independent of one another. Thus a single protocol can be modified or replaced without having to redesign the entire system network. This is an important feature in considering the effect of standards on an actively evolving technology.

In order to appreciate why local network standards are evolving as they are, it is necessary to briefly discuss some features of the lower layers. The lowest level is the physical level which specifies the physical form that data transmission takes. The bit is the basic unit of information sent and received at this layer, and bits can be encoded in a variety of ways depending on the transmission medium. The current transmission media are baseband and broadband signaling. Baseband signaling has no carrier for the data: the signal is simply a voltage change on a cable for a given time period. Broadband signaling relies on the modulation of a radio frequency carrier. Coded pulses of light transmitted over an optical fiber offer another potential transmission medium.[8]

The second layer is the data link layer. One of the functions of this layer is to determine when a device can transmit. In a shared medium network, the access of each machine to the medium is autonomous, much like telephones on a party line. There must therefore be some method to determine which machine gets access to the transmission line. Two of the methods for determining access to the transmission line are contention and token passing.[9]

In the contention method, a link layer needing to transmit first listens to hear if any other device is transmitting. If the line is busy, the device waits. If not, the device transmits. If two or more devices start to transmit at about the same time, the transmissions will collide. The protocol then is for each device to wait a random amount of time before transmitting again. This method is called carrier sense multiple access with collision detection (CSMA/CD).

In token passing, only the device holding the token can transmit. When that device is finished transmitting, it passes the token to the next device. The token is passed around in this fashion from device to device, giving each one in turn access rights to the transmission line.

The higher layers of the OSI model provide further algorithms governing communications among interconnected devices. Each of these layers must be standardized in order for machines from different vendors to be fully compatible with one another.

Local networks can also be physically configured in different ways. The basic configurations are buses, rings and stars. The bus is a central coaxial cable to which machines in the network connect. In the ring topology, the data stations are linked sequentially to form a closed loop. In a star network, the communicating devices are linked through a central hub. When these alternative configurations are taken together with the range of alternatives in the various layers of the OSI model, it is apparent that there are a great diversity of network architectures.

Markets. The diversity of technical approaches to LANs is reflected in the marketplace. Different vendors have offered a variety of networking systems. For example, Xerox' Ethernet is a CSMA/CD baseband system. Ethernet contains elements from three different companies: minicomputers from Digital Equipment Corp., VLSI chips from Intel to implement the software protocols within the equipment, and the system design by Xerox. Wangnet is a CSMA/CD broadband system. Arcnet offered by Datapoint uses a token media-access method on a bus. IBM is reported to be developing a token-ring system. And there are others.[10]

For vendors of proprietary LAN systems, the question of whether to support voluntary standards is obviously an important question. There are both pros and cons from a vendor's perspective. A proprietary LAN locks a user into a vendor's line of equipment. Thus offering a LAN system could be a way of promoting sales of the vendor's other products. On the other hand, there is strong user demand for open networks which would allow a user to interconnect products from different vendors. The total market for LANs might therefore expand more rapidly with standards. The faster expansion of the market could more than compensate for sales lost because of greater competition. This factor becomes especially significant when viewed from a worldwide perspective where no vendor has a dominant position.[11]

portant point w/ in international view

There is also a tradeoff for users. Allowing for open interconnection greatly expands a user's range of choice. Single vendors generally lack the particular range of options that a user wants to best meet its needs. And greater competition will bring down costs. On the other hand, proprietary LANs now function as networks. Since standards are a prerequisite for open networks, the current lack of standards limits their functionality.[12]

The balance among these competing factors is shifting strongly toward open networks. Users are insisting on the opportunity to select equipment that meets their particular needs and vendors are strongly supporting standardization. Thus there are clear incentives for both users and vendors to support the development of voluntary consensus standards.

Before describing current standard-setting activities for LANs it is important to note the existence of a competing technology: the private branch exchange (PBX).[13] The PBX is a computer-controlled switch that uses the telephone system to route voice or data signals in analog or digital form. A reputed advantage of PBXs over LANs is their proven efficient software for handling voice communication and routing messages optimally over the least cost transmission paths. They are also reported to have greater potential for optimizing voice and data integration and adapting to equipment from many different vendors. Advocates of LANs argue that PBXs are too slow for transmitting large amounts of data from one computer to another or for handling high-speed distributed data processing. On the other hand, PBXs can interconnect thousands of telephones and terminals whereas currently LANs cannot handle more than several hundred connections. Telephone systems are also cheaper to install than LANs.

There is also a new hybrid system that blends a PBX and LAN into a single system for routing voice, data, electronic mail, facsimile or graphics. Several vendors offer the hybrid integrated PBX. Some see the hybrid network as overkill. Others see it as the ultimate in processing power and flexibility.

The point is that the dust has by no means settled. There is intense technological competition among these competing systems, and different vendors are backing different approaches. This point deserves to be highlighted because standardization plays an essential role even at this early phase in the evolution of local networks because the architecture of the network must be in the public domain if the network is to accomodate the equipment of multiple vendors.

IEEE Standard. The first standard-setting activity to describe is that of the Institute for Electrical and Electronic Engineers (IEEE). The IEEE 802 technical committee is developing standards for the two lowest level protocols of the OSI model, i.e., the physical layer and the data link layer. This is the natural place to begin since it determines the physical basis for compatibility among equipment. The committee began its work in 1979, and the results are now emerging.[14]

The committee found that it was not possible to develop a single standard for the various systems on the market. The two principal means for determining access to the transmission medium, contention and token passing, are incompatible. The committee therefore decided that the only feasible way to standardize LANs was to develop a family of standards. Consequently, standards are being developed for baseband and broadband bus media using CSMA/CD (IEEE standard 802.3), for baseband and broadband bus media using a token passing access method (IEEE standard 802.4), and for baseband media using a token ring system (IEEE standard 802.5). The first two standards have already been completed, and the third is expected next year.

In addition to local networks, the committee is developing a metropolitan area network (MAN) standard (IEEE standard 802.6). A metropolitan area network is a form of LAN that comprises a radius of up to 25 km.

All of the standards have been specified to work under a single logical link control standard (IEEE standard 802.2). Finally, a standard for higher layers of shared medium local networks is being developed to specify a consistent method for internetworking, addressing and managing local networks (IEEE standard 802.1). This standard will also serve as a companion document to specify the relationship between the other IEEE 802 standards.

The timing of the IEEE family of standards is an important point worth noting. A standard cannot be developed before there is an adequate theoretical and practical knowledge base for developing it. On the other hand, if proprietary systems become too well established, there would be strong opposition to the development of standards that did not conform to the proprietary standards. Thus the timing of standard development is a critical matter.

In the case of IEEE 802 standards, the development effort was initiated at about the earliest time feasible. While the general principles of LANs were well established, there were still many technical details to work through. The meetings of the technical committee became the forum for resolving these technical issues. The cooperative problem solving character of these meetings was especially pronounced in the case of metropolitan area networks. The first approach pursued by the committee was subsequently abandoned because technical feasibility had not been adequately demonstrated. The committee therefore returned to square one and started over.

Of course, the industrial participants in the voluntary consensus process are also there to protect their firm's economic interest and to prevent competitors from gaining an advantage through the standard-setting process. However, this motivation does not prevent participants from cooperating in resolving common problems in the nonproprietary domain of an industry's technology. The development of the IEEE 802 standards provide a good illustration of this typle of cooperation among competitors.

Another point worth noting is that the IEEE has modified its procedures for initiating the standard development process as a consequence of the experience in developing the 802 standard. Neither IEEE nor the American National Standards Institute (ANSI) were interested at first in developing standards for local networks. A committee of the Computer Society, which is a member of IEEE, provided a home for beginning the effort. However, the Computer Society is a professional society whose principal functions are holding meetings and publishing technical papers, not setting standards. Before 1979, it had developed only a few standards of peripheral interest. Moreover, it had virtually no established procedures for developing standards. Neither the IEEE nor the Computer Society were accredited at that time by ANSI. Nonetheless, the 802 committee was launched in a relatively expeditious manner under the auspices of the Computer Society. This met the essential requirement of a technically respectable forum. Recognizing that standards must be developed expeditiously in a rapidly advancing field if they are to serve a useful function, the IEEE has now modified its procedures to facilitate initiating the standard setting process.

Off the wall comment: we are now beginning to pay the price for that misjudgment!

International participation in the development of the 802 standards is another significant feature. As a professional society, IEEE has many foreign as well as U.S. members. Broad foreign participation helps to pave the way for expeditious approval as an ISO standard. The 802 standards that have already been completed were just recently proposed as ISO standards.

Whether they will be approved or not will be known shortly. However, there are currently no alternatives and no significant objections to the 802 standards.

Finally, OTA has asked about the effect of IBM company standards. IBM has actively participated in the development of the 802 standards. As indicated earlier, IBM is reported to be a developing a token ring system, and an IBM representative chairs the 802.5 token-ring subcommittee. IBM representatives also made various technical presentations to the committee, which were considered unprecedented since IBM had not yet introduced its own system. An IBM representative indicated in an interview that supporting standardization is definitely the right strategy for IBM in the current world market.

participated in as different from contributed to

Role of NBS. The Brooks Act (P.L. 89-306) authorizes the Secretary of Commerce to establish uniform automatic data processing standards for use by federal agencies. The principal source of expertise for developing these standards resides in the Institute for Computer Sciences and Technology (ICST) at NBS. ICST plans to develop a family of Federal Information Porcessing Standards (FIPS) for LANs. So far two have been developed. ICST is also active in supporting the development of voluntary consensus standards in standard-setting organizations like IEEE, ANSI and ISO. ICST personnel serve on dozens of technical committees. The research activities at ICST provide an important base of support for these standard-setting activities. For example, ICST designed and built one of the first LANs in 1976.

The first proposed FIPS specifies the protocols for the first two layers of the ISO/OSI model. The FIPS specifies a baseband CSMA/CD system, and is based on the IEEE standard 802.2 and 802.3.[15]

The second proposed FIPS breaks new ground. It specifies the protocol for layer 4, the transport layer, and was developed at ICST.[16] The draft standard has also been widely circulated on an informal basis both in the U.S. and abroad, to pave the way for its adoption by ANSI and the ISO. Thus ICST has used its mission to develop federal procurement standards to promote national and international consensus as well.

this of course does not tell the full story, that the ICST protocol is one of 5 protocols for layer 4, etc. etc.

ICST has also developed test protocols to monitor performance of a local network and ascertain compliance of equipment with standard specifications. This is an important feature because a standard is only as good as the test for ascertaining compliance. Both ICST and industry representatives indicated that it may be useful to propose these test protocols as standards themselves. This could have important trade implications. Mandatory, government conducted certification tests could be used as nontarrif trade barriers. An alternative favored by NBS would be to have the test protocols adopted as ISO standards whose application would be voluntary.

ICST will also host a demonstration shortly of a CSMA/CD network. Several different vendors will bring their equipment and link them together in a prototype office automation network.

This engineering test is a prelude to a planned public multi-vendor network demonstration at a conference in 1985.

A parallel demonstration of a factory automation network will be held shortly at General Motors Research Laboratory. Here again, several different vendors will bring their equipment and hook them together in a token bus network. This is the type of LAN favored for factory automation whereas the CSMA/CD and the token ring seem to be favored for office automation. The idea for this demonstration grew out of a meeting hosted by ICST.

In both demonstrations, the systems will implement the appropriate IEEE standards and the ICST transport layer protocol. Both demonstrations will also use the ICST test protocols to monitor performance of the network and compliance of the equipment with standard specifications. Thus the test protocol not only facilitates commercial transactions, but is a useful research tool. These demonstrations are essentially cooperative engineering tests to work the bugs out of mult-vendor networks. Their significance lies in the opportunity for competing vendors to cooperate in testing the compatibility of their equipment in a functioning local network.

It is apparent that ICST is playing a technical leadership role in advancing LAN technology. Industry representatives interviewed in this study expressed high regard for the technical quality of ICST's work and the value of its role. One industry official commented that the significance of ICST's contribution had increased substantially in recent years.

In this regard, it is pertinent to note that the General Accounting Office (GAO) issued a report in 1978 highly critical of the FIPS program.[17] GAO asserted that too few standards had been developed, and that test procedures were lacking to certify compliance with those that did exist. Consequently, federal agencies became locked into particular suppliers of computers and related services. The report estimated that this dependence cost the federal government hundreds of millions of dollars per year. This report does not attempt to critically assess the FIPS program. Clearly, however, things have changed for the better.

Finally, it is important to note that in addition to the role of developing procurement standards, ICST is actively advancing the nonproprietary portions of networking technology. It advances this objective through its own research program, active participation in developing voluntary consensus standards, developing test protocols, and fostering cooperative research efforts with industry. These efforts also contribute to the FIPS program and rely on the same base of technical expertise. However, it is important to recognize the role of advancing the nonproprietary knowledge base as distinct from that of developing procurement standards.

American National Standards Institute. The American National Standards Institute (ANSI) also plays an important role in developing LAN standards. The ANSI technical committee X.3

handles a number of topics in information processing. This committee works through the Computer Business Equipment Manufacturers Association, a trade association. The X.3T5 subcommittee is developing standard protocols for the top four layers of the ISO/OSI model. The top four layers are independent of the type of network. The chairman of the X.3 committee indicated that the draft standards for the transport and session ~~presentation~~ layers have reached the balloting stage. The committee is proceeding on the basis of seeking ISO approval for these standards.

Impact of Standards on R&D. The impact of standards on private sector R&D should by now be apparent. There is clearly strong interest in the development of standardized protocols for local networks. This level of activity is particularly significant when one considers that standardization has not been a major factor in the computer industry to date. As discussed earlier, many vendors anticipate that standardizing protocols will enhance the growth of LAN markets. Under these conditions, one would definitely expect standards to be stimulating investments in R&D.

Interviews with industry officials indicate that this is indeed the case. Reports in the trade press confirm this view. Many vendors of proprietary LAN systems have announced that they will support IEEE standards and bring their systems into compliance.[18] Numerous chip manufacturers have also announced they will develop chips implementing the IEEE standards.[19] Intel has even introduced a computer recently that implements the Class ~~level~~ 4 transport protocol developed by ICST.[20] ← I wonder how much memory it requires and what its performance is?

Firms often do not wait until a standard has been finalized to initiate product development projects which implement the standard. Once the draft standard has reached a level of specificity sufficient for designing products, and once consensus has pretty well gelled, many firms begin to design new products that embody standard specifications. There is obviously a risk in this approach, but there is also a risk in waiting and letting competitors get the advantage of being first.

Assuming the current trend in developing standardized protocols continues, the compatibility of equipment from different venders will be taken for granted. Vendors will concentrate on the particular value-added features that they can put into their products to give them a competitive advantage. The competition engendered also seems likely to bring down costs, which will further expand the market. Users will be better able to purchase cost-effective products well suited to their particular needs. Thus the effects of standardization appear at this point to be strongly positive.

Of course, standards can have an inhibiting affect on innovations in technology. By definition, standards exclude certain possibilities. However, voluntary consensus standards are not immutable. They are frequently revised to keep pace with changing technology. In the LAN market, there is also no firm or group of firms with the leverage, or apparently the desire, to block the development of standards. Under these conditions, one would expect the voluntary consensus process to continue to be responsive to the mutual interests of both vendors and users. Consequently, the risk of a negative impact on innovation in local network technology does not seem to be very great.

It is also worth noting a second impact of standards on R&D: the two forthcoming demonstrations of local networks. These two demonstrations are a direct consequence of the standards developed to date. Thus standards are contributing to further advances in the nonproprietary dimensions of local network technology, as well as to proprietary product development. The development of standards themselves advance the nonproprietary knowledge base of an industry's technology. The impact of local network standards on proprietary product development provides a graphic illustration of the dynamic relationship between the nonproprietary and proprietary elements of an industry's technology. In this case, standards are also contributing to a rather unusual cooperative effort between competitors. Significantly, and appropriately, NBS has been an active contributor and facilitator both in developing standards and in the cooperative demonstrations.

INTEGRATED SERVICES DIGITAL NETWORK

Integrated services digital networks (ISDN) look like the ultimate transformation for the telephone system. From a system carrying voices over wires, it is evolving to a system carrying voices, data, facsimile and video over wires, cables, optical fibers, microwave radios and satellite links: truly an integrated services digital network. The system will be digital -- the use of binary ones and zeros instead of time-varying analog voice signals -- because that is the language of computers. Digitization allows people to talk to people, people to talk to computers, and computers to talk to computers. Digital technology also lends itself to VLSI circuit chips, promising miniaturization and cost savings.

The case of ISDN presents both similarities and differences to that of LANs. Both are network technologies, and the ISO/OSI model provides a frame of reference in both cases. Standardization is also critical to implementation in both cases. Consequently, standards are playing an essential role early in the evolution of both technologies. Moreover, the market potential of ISDN is generating great interest among both carriers and vendors of telecommunications equipment here and abroad. Correspondingly, one would predict that standardization will stimulate private investments in R&D, although the standardization process does not seem to be as far advanced in the case of ISDN as it is in the case of LANs.

The differences in the two cases are equally significant. The scale of the networks is vastly different in the two cases. ISDN is envisioned as a national and international network, not a local network. Correspondingly, telecommunication carriers will own and operate the network as a way of providing services to users, whereas LANs are primarily for the internal use of a single organization. Another very important difference is that telecommunications is a regulated industry whereas the computer industry is not. Consequently, the government role in the two cases is very different. Similarly, the role of foreign governments is very different because they own and operate the telephone systems. Thus the dynamics of developing consensus in the pertinent international standard-setting body is also different.

ISDN could be developed as a case study in its own right. Its implications are more far reaching than LANs, and the dollar volume of investment envisioned for ISDNs is far greater than that for LANs. However, for the particular purposes of this study, it is more instructive to develop the case study of ISDN in comparision to local networks. This is especially useful in view of the limited time available for completing this study. Thus, wherever helpful, we will make reference to local networks in order to highlight both the similarities and the differences between the two cases.

Digital Networks. Economy and flexibility are the primary motivations for ISDN. It is much more efficient to supply all the various digital communication services through a few standard hookups than by installing individual circuits for each application, whether it is voice, facsimile, teleconferencing, computer-to-computer, or other service. With ISDN, all communication services will be available to the user through a single link to the telephone network. Since all transmission will be in digital bits, this connection might be called a "digital pipe."[21]

A single digital pipe for all communication services is analogous to today's power system. All electrically powered equipment can be hooked up to a standardized interface: the wall outlet. There is no need for a separate new power line for each piece of equipment. The only restriction is that a customer cannot draw current at a rate greater than the maximum rate allowed. Similarly, in an ISDN, customers will be able to use the network for whatever purpose they choose as long as they do not exceed the maximum bit rate of their digital pipe.

Because of the increasing use of digital technology in the telephone network, ISDNs are evolving naturally from today's telephone system. Digital switches and transmission systems, including lightwave systems, are expected to account for approximately 80 percent of the Bell Operating Compnay's metropopitan area circuit miles by 1990. In recent years, a number of specialized digital services have grown up: digital private line services. Other industrialized countries are also moving toward digital telecommunication networks. However, much of the local and national networks are still analog. Thus ISDNs are not likely to surface until the late 1980s or early 1990s when most of the telephone network is digital.[22] And whether a full blown ISDN will ever become a reality depends on whether agreement is reached on ISDN standards.

CCITT Standards Activity. With the variety of digital technology available to support an ISDN, there is clearly a need for standards to implement such a system. The principal forum for developing ISDN standards is the International Telegraph and Telephone Consultative Committee (CCITT). CCITT is part of the International Telecommunications Union (ITU), a specialized treaty agency of the United Nations. CCITT ~~began studying~~ initiated the study of the feasibility of an ISDN ~~in 1976~~ at its 1976 XVIII Plenary ~~session~~ Assembly, held every four years. In 1980, Study Group XVII was given primary responsibility for establishing general ISDN standards. The next CCITT Plenary Assembly will meet in November, 1984. There is currently a great deal of activity, both in the United States and abroad, to develop standards for approval at this meeting.

In the United States, government agencies, common carriers, vendors of telecommunications equipment and major users are involved in this process. Since the ITU is a treaty organization, the Department of State is the official U.S. representative. The Department of State established the United States Organization for International Telegraph and Telephone Consultative Committee to discuss and develop U.S. positions on matters before the CCITT. Government agencies involved in ISDN discussions include the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA) and the Defense Communications Agency. Private standards organization involved in ISDN discussions are the Electronic Industries Association (EIA), ANSI, and the IEEE.

The motivation for the ISDN standards differs in an important way from the motivation for LAN standards. In the case of LANs, it was the development and marketing of different local networks that prompted standardization. In the case of ISDN, there was no product to motivate standardization. Rather, telecommunication carriers wanted to define ISDNs as a way of responding to future telecommunication demands. Equipment vendors have generally become deeply involved only as the draft standards have become more specific.

The central objective of the CCITT standardization activity is the development of a universal user-network interface, or at least a small group of standard user-network interfaces. With a universal interface, a terminal can be plugged in and used anywhere in the world. The same plug will connect the terminal to both a power source and a telephone network for data transmission. CCITT intends that terminals using an ISDN be technologically independent of the transmission medium, whether it be conventional cables, fiber optics, or satellites.[23]

This focus on the user-network interface is obviously different than the focus in developing local network standards. There the first step was to specify the transmission medium and the mode of access to the transmission medium to ensure compatibility among the equipment of different vendors. There was no need to establish a universal user-network interface because the user owns the network. In the case of an ISDN, the network is owned by the telecommunications carrier, and the user accesses the network to receive various communication services. While both use the ISO/OSI model as a frame of reference, the focus of standardization is basically different in the two cases. LANs and PBXs can also be linked to an ISDN, but this linkage is still a user-network interface.

The CCITT draft recommendations try to standardize user-network interfaces by emphasizing performance characteristics and minimizing requirements on equipment design. The purpose is to leave maximum latitude for innovation by manufacturers of terminal equipment while simultaneously ensuring terminal portability. This approach should encourage product innovation and enhance competition.

CCITT also wants the user-network interface to be stable. A stable user-network interface would allow equipment vendors and carriers to innovate independently of one another. The feasibility of achieving a stable interface depends, in part, on the stage of development of the technology. For example, the CCITT Recommendation X.25 defines the interface for a packet-switched network. The standard was put forth in 1976. It has been revised twice since then, with the corresponding need for changes and adaptations in equipment. However, when X.25 was first developed, it was very much at the leading edge of the technology.[24] ISDN is a better established technology at this stage. Thus the prospects for stability are better.

It is also worth noting that a performance oriented standard requires some kind of test protocol to certify compliance. One industry representative indicated that there has been some attention given in the United States to developing such a test protocol, but little attention as yet within CCITT. To date, attention has been focused on developing the standards themselves.

A basic difference dividing the United States and European countries is that telecommunication services are provided by competitive carriers in the United States and by government monopolies in Europe. The emphasis on standard user-network interfaces would be adequate where there is only a single government-owned network in a country. It does not suffice where there may be several, interconnected networks, not necessarily all having the same characteristics.

This issue highlights a further difference with the standardization of local networks. Neither government monopolies nor regulatory agencies are a factor in the case of LANs. Policy issues and political differences were therefore unimportant.

Still another difference is the relationship between domestic and international standard-setting bodies. In the case of ISDN, the international body is the preeminent forum. Domestic standard-setting bodies are playing an important, but definitely limited role. The ANSI X.3 committee is focusing on data communications, and the Electronic Industry Association on physical interface aspects of ISDNs. In the case of local networks, domestic organizations played the leadership role. While the ISO is certainly not a rubber stamp for standards developed in the United States, the U.S. standards were developed with foreign participation and consultation to pave the way for subsequent adoption by ISO. This difference reflects the different evolution of standardization efforts in the two cases.

Finally, OTA asked about the role of AT&T in developing ISDN standards. With regard to technical contributions in developing a U.S. position, AT&T unquestionably plays the dominent role. AT&T sends the most representatives to meetings, and these representatives present most of the technical papers. In part, this may be a carry-over from the old way of setting standards for the telephone system. AT&T would develop the standards internally and then send them out for review by independent telephone companies. On the other hand, in terms of the relative sizes of the U.S. companies participating in the CCITT negotiations, the contributions of AT&T may not be disproportionate. It is also worth noting that Bell System and independent telephone companies have agreed to form a new organization to set standards for the public telephone network and its equipment.[25]

It should be noted that both standard setting efforts are basically technical. This in itself raises an important question for ISDN: What is the process by which the policy implications of ISDN will be clarified and resolved? This question brings us to the next topic.

Role of FCC. The FCC has recently issued a Notice of Inquiry (NOI) concerning ISDN.[26] The purpose of the NOI is to promote discussion of the issues raised by implementation of ISDN. Some of the issues raised in the NOI include

- How can the FCC continue to promote competition in an ISDN environment?
- Are CCITT draft recommendations sufficiently flexible to accommodate existing FCC regulatory policies, such as the distinction between basic and enhanced services outlined in Computer II?
- How will ISDN affect U.S. users, service providers and equipment manufacturers?

A basic problem is that proceedings in the CCITT forum are almost exclusively on a technical level. It is by no means a trivial matter to make the translation from the technical language of network engineering to the policy issues that concern the FCC. The technical system envisioned in the draft CCITT recommendations may well work. But would it be desirable from a public policy perspective? For example, what are principles for establishing equitable tariffs in an ISDN? These principles have not yet been established.

FCC's NOI provides only a general background discussion of these issues and a request for comments. In its response to the NOI, NTIA strongly endorsed FCC's issuing the NOI because it feels that a public dialog on these issues is essential.[27] FCC and NTIA personnel also participate in the CCITT study groups, and help to raise the consciousness of private sector participants concerning these policy issues.

However, the adequacy of the current decision process for simultaneously resolving issues in the CCITT forum and the FCC forum is not apparent.

For example, one issue is whether equipment terminating the network service should be owned by the user or the network. The draft CCITT recommendations envision the network terminating equipment as an integral part of an ISDN network. This is necessary to provide a standard user-network interface independent of transmission medium. However, in the Dataphone Digital Services decision, the FCC ruled that network terminating equipment is not part of the network. Extending this decision to all digital services, as done by the FCC, seems to preclude the type of user-network interface envisioned by CCITT.[28] It is not immediately obvious that the current decision process suffices to resolve this kind of issue in a timely way.

It is provocative to compare the role of the FCC in the case of ISDN with that of NBS in the case of local networks. Obviously, the policy stakes are much greater in the case of ISDN. Yet the government has dedicated mcuh greater technical resources in the case of local networks. To be sure, NBS's role of performing research and developing government procurement standards is inherently technical, whereas the dedication of substantial technical resources is generally not required for the FCC to fulfill its mission. Another difference is that the FCC is used to working through the notice-and-comment procedures of a

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regulatory agency--basically a lawyer's procedural approach to problems--whereas NBS is used to working through the voluntary consensus process. However, this comparison does raise the question whether some elements of the NBS approach might be better suited than the approach taken by the FCC to clarifying and resolving the issues raised by ISDN?

Impact of Standards. The standardization of user-network interfaces will create a very significant market for makers of terminal equipment and other ISDN-related products. Industry representatives interviewed in this study indicate that the CCITT standardization activities have already stimulated some R&D. For example, one chip maker has laid out most of a chip to implement the draft protocols, although there are still some parts missing. One predication that appeared in the trade press is that once the CCITT recommendations have been finalized, products will appear on the market within two years.[29] The level of interest among equipment manufacturers in the CCITT negotiations is unquestionably very high.

Telecommunication carriers have already made massive investments in moving toward a digital network. However, for the most part, these investments can not be attributed to draft CCITT standards. Rather, the CCITT standards are being drafted to ensure compatibility with the existing system. On the other hand, a number of foreign countries are planning limited ISDN services in the near future.

There is little doubt that if consensus is eventually reached, standardizatiion will prompt very significant investments in R&D. In this regard, the case of ISDN is basically similar to that of LANs. By the same token, there is a legitimate concern that standards might unduly restrict the latitude for innovation. Yet, as in the case of LANs, it also appears that, with care, the benefits of standards can be realized without unduly restricting opportunities for innovation.

The timely resolution of public policy issues raised by ISDN may also be an important factor. The failure to resolve these issues could greatly retard the introduction of ISDN services in the United States. Moreover, how these policy-issues are resolved can affect the relationship betweem standards and innovation. For example, a stable, standard user-network interface would allow carriers and equipment vendors to innovate independently. Conversely, if the user's equipment has to accommodate changes in network technology, it is likely to have an inhibiting effect on innovation.

SUMMARY

The two case studies of LANs and ISDNs, together with the examples cited from the literature, offer persuasive evidence of standards' impact on R&D. This result is hardly surprising. Technological innovation is not a linear process proceeding from idea to research to product development to manufacturing and commercialization. Rather, it is an interactive process that tries to match market needs with technical feasibility. Since standards help to define the markets for technology, they also influence R&D. In particular, these two case studies show how compatibility standards can have a strong impact on new product design. Standardized test protocols can also affect R&D, but in a rather different way: test procedures are themselves valuable research tools.

These case studies offer excellent illustrations of the dynamic relationship between the proprietary and nonproprietary elements of an industry's technology. Local networks and ISDNs are especially good illustrations because they are system technologies. Standards are an integral part of advancing, as well as implementing, these technologies.

The standard-setting process is itself an important feature of the effects of standards on innovation. A special feature of this process derives from its being a cooperative effort among competitors. For example, to gain a competitive advantage, firms often initiate product development projects on the basis of draft standards once the standards have reached an adequate level of specificity and consensus. Thus, while standard-setting requires cooperation, the process is never far removed from marketplace competition.

The most striking difference in the two case studies is the government role. In the case of local networks, the government is facilitating advances in the technology, both directly and indirectly through developing procurement standards. In the case of ISDN, the government is a regulator trying to define the issues raised by ISDN.

A more subtle difference between the two case studies is the relationship between domestic and international standard-setting organizations. In the case of local networks, domestic standard-setting organizations have, for the most part, led the way. In the case of ISDN, the initiative for standardization came from the international organization.

These two case studies provide a very tenuous basis for drawing any conclusions about the relationship between standards and international trade. Yet the differnce between the two case studies might be significant in this regard. All other things being equal, the combination of the government playing a facilitating role and domestic standards bodies having the initiative should auger well for U.S. interests. Conversely, the combination of the government playing solely a regulatory role and the initiative coming from an international standards body, most of whose members are foreign government monopolies, may be cause for concern. The trade issue is well beyond the scope of this report, but it might be worthy of further attention.

Persons Interviewed

John Rigonotti and John Hefner, Institute for Computer Sciences and Technology, National Bureau of Standards.

Maris Graube, Tektronix Inc.; Chairman, IEEE 802 Committee.

David Carlson, AT&T Information Systems; Chairman, ANSI
X3S3 [redacted] Committee

Robert Donnan, Terry Taylor and Dennis O'Shea, IBM; Donnan is Chairman of IEEE 802.5 Subcommittee.

Anthony Rutkowski, Federal Communications Commission.

Richard Firestone, National Telecommunications and Information Administration.

Warren Gifford, Bell Telephone Laboratories, Inc.

Eric Scace, GTE Business Communications Systems.